The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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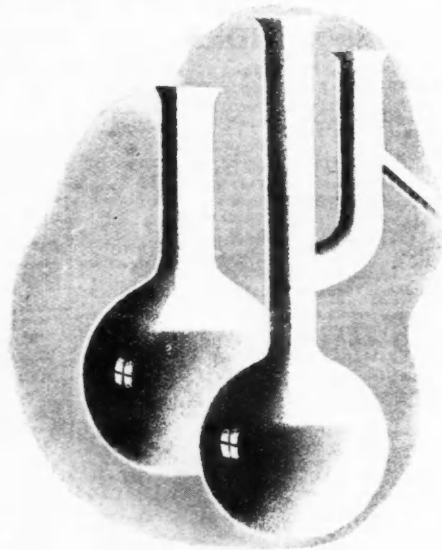

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams ALLANGAS FLEET LONDON — Telephone: CENTRAL 3212 (12 lines)

GLASGOW: 116 Hope Street (Central 3970) — BIRMINGHAM: Daimler House, Paradise Street (Midland 0784-5)

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Equipment for Chemical Industries

THE need for increasing production has been emphasised during the past weeks by Government spokesmen and by leaders of industry. In our article "Industrial Policy," a fortnight ago, some aspects of the problem were discussed, and previously we pointed to the *damnosa hereditas* left us by the late unlamented war in the shape of controls of every kind. Some measure of control there must be just now over raw materials and production. It would be foolish to expend a large labour force upon luxuries or frivolities while leaving essential work undone. With control, however, there is the responsibility for good planning. There is the responsibility for instituting sound long-term policies. Is there not to-day too much hand-to-mouth opportunism about our industrial policy?

Industrial planning is the responsibility of many Ministries. They may work in harmony, or they may not. Even if they do so, there is always scope for mistakes which can immediately be seen to be ludicrous when they are pointed out, but which do not always come to light. The Civil Service is not to blame; inconsistencies are almost inevitable over so wide a field as the whole range of British industry: the only real cure is the provision of ample supplies of goods and labour—or manufacturing capacity, which is not quite the same thing—and freedom from control. Freedom from control cannot be achieved, however, until supplies are ample. An example of the sort of difficulties we have in mind was recently provided by Mr. E. J. Erroll, M.P., in regard to printing machinery. A firm in his constituency is producing printing machinery for export, while another that is making grinding wheels—essential equipment in engineering workshops—receives no priority in labour or material because its products are for the home market only. Modern printing machinery cannot be made without grinding wheels, however, and thus the manufacture of the printing machinery for export is being held up. Mr. Erroll added: "In the same district, machine tools are being made for direct export which are urgently needed by firms elsewhere making more valuable machinery also intended for export, but which, too, is desperately needed in England."

This opens for discussion a subject upon which we had something to say while the war was still on, namely: Is it desirable to equip foreign manufacturers before we equip our own factories? It is always better to illustrate an argument in terms of

On Other Pages

common experience, and for this purpose we shall take colliery equipment. Let us suppose that upon taking over the mines, the National Coal Board should find itself able to instal immediately a large number of underground loading machines and conveyors. This measure would assist materially to solve manpower difficulties at the coal face and would considerably ameliorate the hard work performed there. It would increase production of coal. Would the Government maintain that the right thing to do was to forbid the manufacture of loading machines and conveyors for supply to British collieries until all foreign export orders that we could obtain had been fulfilled? To supply the home market first would enable coal to be obtained in quantities sufficient to keep our industries going without fear of breakdown, and might allow also of the export of coal. To supply the foreign market would gain immediate foreign currency. The one policy is hand-to-mouth opportunism; the other is sound long-term planning. The present Government policy seems to be to grasp the immediate short-term advantage and to let the long-term policy go hang. If that is so, it is basically unsound.

Is the provision of chemical plant developing on sound lines? There are conflicting views and there is conflicting evidence. We hear of manufacturers complaining that they cannot get British chemical plant in reasonable quantity or with a reasonable time of delivery, while foreign competitors are being supplied at the highest priority. It is pointed out that in this way while we may be gaining a little export trade in chemical plant, we are losing our long-term market for chemicals which can be made cheaper and possibly of better quality in the newer plant supplied abroad. We are throwing away our birthright for a mess of potage.

The contrary view might be that this is an opportunity which can never return of transferring to Britain the foreign trade in chemical plant that was so prominent a feature of German industry before the war. The world is crying out for chemical plant; America can supply some, but by no means all. Britain, it is said, can seize this market, if our manufacturers are given the opportunity. We have the skill, but it is doubtful whether we have the facilities to do so. Steel is in short supply and must be rationed according to priorities governed by the policy of those in control. The labour force is insufficient until we can instal the machines necessary for an increase in production per man-hour; but the machines that we need for this purpose are being sent abroad. Worst of all, perhaps, the supply of chemical engineers is insufficient and without these we cannot hope to undertake sufficient world trade to capture the markets held previously by Germany. The question is asked whether the British chemical plant manufacturer has the power to undertake any considerable foreign business at the moment, and whether he should not concentrate on supplying the home chemical industry with the plant it requires.

The answer to this question may well be that unlike most industries which depend on a sound home market for their stability in the export market, it could be argued that the home market for chemical plant in normal times is not sufficient to keep a really good chemical plant industry in being. The export market may well be the more important and it may well be that by reason of the skill and experience gained abroad the British chemical plant manufacturers can properly cater for the home market, and can only do so adequately if there is a large volume of foreign trade.

This appears to us to be a problem that cannot easily be solved, and that must be the subject of a long-term policy. What is the long-term policy of chemical manufacturers towards the export of chemical plant? Why should not chemical manufacturers assist plant manufacturers with advice in a joint effort to secure foreign markets, while safeguarding the British position as regards chemical manufacture? We ask this question because it appears from such information as we have that that was the German practice. Nothing but good can come from such collaboration. Nothing but good can come from Britain taking her rightful place as a great chemical plant-manufacturing centre for the world. That is the type of export which this country should encourage for it is based on skill in design and manufacture of a very high order. If buyers cannot get what they want in this country, they will go elsewhere and we shall have lost them—permanently. But we suggest that before our goods are placed on offer those who now exercise controls should decide what should be the long-term policy regarding priorities for chemical plant.

NOTES AND COMMENTS

The Uranium Rush

NEWS of the reported agreement between the American and Belgian Governments for the cession of the whole output of uranium from the Belgian Congo to the United States reveals that the frantic world-wide search for this valuable metal is still in progress. Other reports indicate that many nations are going "all out" in their efforts to find uranium, either in their own countries or else in a country with similar political outlook. One report indicates that the U.S. Navy is to send a gigantic expedition into the Antarctic to hunt for the rare metal. Five thousand men and many ships are to take part in this treasure hunt. What the Russians are doing in this respect is not known, but it can be taken for granted that they, too, are in the forefront of this "uranium rush" which, as one scientist said over twelve months ago, will make the oil rush look like a costermonger's Derby. Britain, too, is not behind in the search for uranium. She is probably in a better position than America in this respect, because the mine in Canada from which most of the world's uranium is now obtained is in the King's name. But expeditions have been sent in the past few years to, among other places, the Falkland Islands, and it can be assumed with reasonable certainty that geologists are included in the personnel. It is a strange irony that a substance unknown to the man-in-the-street up to two years ago should now be the subject of much heart-burning on the part of scientists, and much exploration work on the part of governments. It is estimated that known sources of uranium if used for power purposes, are only sufficient for about 200 years. So, in addition to giving security to governments not at present in possession of uranium mines, new sources will have to be found if only to make sure of power supplies for the future.

Guarding Dangerous Machinery

THE Factories Acts lay upon the employer a very stringent duty with regard to the protection of dangerous machinery. The extent of this duty was emphasised by a recent decision of the Court of Appeal. The Court went so far as to say that where there is a definite breach of a safety provision imposed by statute on the occupier of a factory, and a workman is injured in a way that could result from that breach, the onus of proof shifts on to the occupier to show that the breach was not the cause of the injury. In the ordinary way, the worker who claims that he was injured through a breach of the Factories Acts, has to prove the statutory offence and then prove that he was injured as a result of the statutory offence. In this case the employers also pleaded that they had delegated their duty of protecting the machine to the workman who was injured. The Court rejected this plea, too. Such a plea will not succeed, apparently, unless the employer proves clearly that the workman to whom he has delegated the duty is fully apprised of the nature and extent of the duty and is competent to discharge it. Lord Justice Scott remarked: "The truth is, we expect, that the defendants did not take the trouble to ascertain what kind of guard was required by the statutory rules, or did not care whether they were being broken. If so, it would be absurd to draw an inference that their responsibility has been shifted by delegation on to the shoulders of the workman."

Shy Scientists

WE Britons generally have always been disposed to practice self-deprecation until it becomes a fault, but in no section of the community is there a greater tendency to hide shining lights beneath the proverbial bushel than among scientists. Not once, but often, has it happened that we have left it to another nation to proclaim with much blowing of their own trumpets some outstanding new development for which they claim all the glory, when in fact our own scientists have themselves made the same discovery and brought it to the same stage of practicability—possibly long before the other nation had even dreamed of it. Then, belatedly, we come out with a rather apologetic claim of our own, as though to say: "Well, we knew about it all the time, but didn't like to mention it."

Mechanical Calculator

SUCH is the case following the publicity recently given to the electronic calculating machine developed at Pennsylvania University, to which we referred in these columns last week, for it has since been

revealed that an automatic calculating machine capable of multiplying two 10-figure numbers in two-thousandths of a second has been planned by the Mathematics Division of our own National Physical Laboratory. Costing between £100,000 and £125,000, it will take two or three years to complete. The machine is called the A.C.E.—automatic computing engine—and is, in fact, claimed to work at possibly a higher speed than Pennsylvania's E.N.I.A.C.—Electronic numerical integrator and computer. Heading the team working on the A.C.E. are Sir Charles Darwin, F.R.S., director of the Laboratory; Dr. A. M. Turing, who may be described as its creator; Mr. J. R. Womersley, superintendent of the Mathematical Division; and Professor D. R. Hartree, of Cambridge University.

A Misnomer ?

INCIDENTALLY, Professor Hartree has written to *The Times*, deprecating the use of the term " electronic brain " as descriptive of the American and similar inventions. He is possibly the only person in this country who has actually inspected and used the Eniac. He emphasises that such a machine is not a substitute for the thought of organising the computations, only for the work of carrying them out. " These machines," he writes, " can only do precisely what they are instructed to do by the operators who set them up. It is true that they can be set up in such a way as to exercise a certain amount of judgment. But it must be clearly understood that the situation in which judgment has to be exercised, the criteria to be applied, the way the results of applying these criteria are to be assessed, and the decisions as to the action to be taken on these results, must all be fully thought out and anticipated in setting up the machine." Professor Hartree is undoubtedly right in pointing out that the term " electronic brain " is misleading in that it ascribes to such machines capabilities they do not possess.

Plastics Exhibition

ALTHOUGH plastics are playing an ever-increasingly prominent part in our daily lives, few people realise how extensive is the range of articles now being produced in this field. By many, indeed, the term " plastics " is vaguely associated merely with what are regarded as war-time makeshifts in the way of clothing or furnishings, and they remain in complete ignorance of the fact that many of the most useful articles in common use are made of plastics. It is all to the good, therefore, that an opportunity should be afforded to the general public of seeing some of the latest plastic developments and for this reason the exhibition which has been organised by the *Daily Graphic* in association with the British Plastics Federation, should prove worth while. The exhibition, which is being held in Dorland Hall, Lower Regent Street, London, W.1, from 10 a.m.-7 p.m. daily until November 27, contains everything imaginable from dentures to a perspex violin. In the section dealing with medical and technical goods are artificial eyes, a B.D.H. Lovibond Nessleriser, and the now famous polythene wrapping for mepacrine tablets. The toy section is a veritable children's paradise, and any child would enjoy the model playroom. Special exhibits—which will arouse particular interest among home-lovers are a dining room and bathroom completely furnished and panelled from floor to ceiling in plastic materials which, it is claimed, are non-inflammable and not affected by water or acid.

CONFERENCE ON EXPORT

Delegates from all parts of Britain, representing a wide range of industries, will attend the Export Conference which the Federation of British Industries will hold in Central Hall, Westminster, London, S.W., on November 27 and 28. Means by which Britain's export drive can be further strengthened will be defined and discussed. Mr. Leslie Gamage will be chairman of the conference and it will be opened by Sir Clive Baillieu, president of the F.B.I. Among other speakers will be Sir Stafford Cripps, M.P., President of the Board of Trade; Lord Bennett, former Prime Minister of Canada; Sir John Woods, Permanent Secretary of the Board of Trade; Sir Norman V. Kipping, director-general of the F.B.I.; and Sir Frederick Bain, deputy-president.

The U.S. and U.K. Governments have accepted the invitation of the Dutch authorities to attend a meeting at The Hague on November 25-30 of the International Rubber Study Group. Mr. D. D. Kennedy will represent the U.S. while the U.K. delegation, in addition to Government officials, will include unofficial members representing the rubber industry.

Heat for Drying

Its Application in the Chemical and Allied Industries

THE importance of drying in industry was recognised by the allocation of a whole section comprising three sessions to this subject at the recent Ministry of Fuel Conference: "Fuel and the Future." The evaporation of moisture is one of the most common of all physical processes in industry, but the term "drying" is not confined technically to that single aspect of the subject. It has been defined by Rabold (*Amer. Dyestuff Reporter*, 34, 108-117) as "the removal of any volatile substance from a fibre, fabric, material, or surface, by means of energy in the form of heat."

This, however, is by no means the full extent of what is now termed drying because the "drying" of paints and the hardening of plastics are both now brought under the term "drying." The Ministry of Fuel Conference comprised all these processes and also included factory heating and air conditioning, which may be said to be concerned with the evaporation of water from the human body, together with heat for agriculture and horticulture which involves the drying of grass, grain, and other agricultural products. Some of the "high lights" of the discussion of particular interest to the chemical industry will be considered here, but no attempt can be made to give a full account of all the papers presented.

Paints and Plastics

Three papers dealt with the "drying" of paints and plastics, an operation which is probably better termed "curing" and will be so described here. Attention has been focussed upon what is termed "radiant heating" for this purpose by the success which has been achieved in reducing the curing times from hours to minutes and even to seconds. Published data furnish examples of the substantial reduction in the curing time of modern paint finishes effected by the use of radiant heat; it has been stated that many paints requiring ten to thirty minutes in convection ovens can be processed in one to eight minutes by radiation, and in certain cases the reduction was very much greater, *e.g.*, times of 60-90 minutes being reduced to 0.5 to 4.5 minutes. Claims have been made for the successful application of this method to the drying and processing of textiles, and to the drying of ceramic articles and of many other industrial materials.

The method used is to allow the materials to travel through a tunnel, the sides of which contain electric filament lamps operating with a wire temperature of about 2200° C. or gas heated panels which may be heated to what are termed medium temperatures of 450-650° F. (232-343° C.) or to higher temperatures of 700-1000° C. For almost all normal curing, and particularly for metal finishing processes, temperatures up to 650° F. are sufficient. The radiation from these sources falls directly upon the surfaces to be cured and is there absorbed, raising the temperature to the required degree. It is clear that these processes may be most usefully applied to those operations in which the speed of reaction increases rapidly with temperature. The polymerisation of certain types of paint exhibits this characteristic in a marked degree, and it is in applications of this nature that the most startling results have been achieved.

Choice of Two Processes

Two papers, one by J. C. Lowson, of the B.T.-H. Research Laboratory, and the other by R. F. Hayman, of the Gas Light & Coke Co., dealt with this subject from the point of view of radiant heating by electric or gas equipment. This process must be in competition with the older process of convection heating, and the conference revealed a striking divergence of opinion as to the relative merits and fuel consumptions of the two processes.

It may be mentioned that the first report on radiant heating by the Gas Research Board, a report written by A. L. Roberts and R. Long in 1945, claimed that no hard and fast rule could be laid down as to whether radiant heating or convection heating was the best. The report pointed out that consideration of the fundamental principles of heat transfer by radiation shows that the extent to which radiation can replace convection methods of heating has limitations, which are largely imposed by the nature of the material being irradiated. It would be evident, for example, that if the material to be treated happened to have a low coefficient of absorption, radiant heating would not be satisfactory. There may also be limitations when the temperature of the objects to be treated begins to approach that of the emitting surface. The high temperature of the electric filament does not give the electrical method of heating any particular advantage in this respect since the filament must be enclosed in glass, and the glass cuts off most of the rays above 30,000 Å.

The marked reduction in the time spent in the oven secured by the radiant heating method suggests that the fuel consumption by this method is very much lower than by purely convection methods for this particular class of work. Moreover, according to theory, it should be possible to cure the

paint on the surface of a heavy engineering product without having to heat the whole mass of the metal to this temperature. It is possible to turn off the heat from the filaments or panels at any time when the machine is not in use and to start up again with very short delay. There is thus every reason to suppose that this method will not only save time and vastly increase production per unit of plant, but that it will also be economical in fuel consumption.

Use of Conveyor Oven

This view, however, was controverted by Mr. A. M. Lehmann (of F. J. Ballard & Co., Ltd.), who maintained that the conveyor oven is equally as effective in rapidly curing paints by radiant heating and operates with a very much lower fuel consumption. By a conveyor oven is meant a direct-fired convection oven through which hot air is circulated and through which the goods travel on a conveyor. In the radiant heating system direct radiation must fall on the surface to be treated. If the surface happens to be an awkward shape, such as with a large flat panel, the objects must travel through a radiant heat tunnel "in line ahead," whereas if convection heating be used the tunnel can be fully filled since the hot air will circulate over the surfaces. Convection heating, moreover, will more readily heat up a surface of high emissivity.

Further, Mr. Lehmann reminded the conference that "a most important point to remember is that it is the paint that is the prime factor in quicker drying time, and not the type of oven alone which determines this more rapid form of drying." He claimed that "it has been determined that if speed of drying is considered of major importance, stoving can be completed in a conveyor oven just as quickly as in a radiant heat oven, and at the same time produce equal, if not better, results, provided the same type of paint is used in each instance. For many years paint manufacturers have supplied, for general industrial use, colour stoving paints embodying an oil base, and it has been generally agreed that the drying time required for this type of paint was anything up to one hour at a temperature of 250° to 300°F. in a conveyor oven. During recent years great developments have taken place in paint manufacture, and, briefly, I would refer to two paints now generally known to industry as urea formaldehyde and medium alkyd resins, both of which can be subjected to higher and greater variations of temperature, and can be stoved in quicker time than oil base materials. It is paints of the urea formaldehyde and alkyd resins which are generally used in conjunction with radiant ovens."

Mr. Lehmann gave some striking figures claiming that whereas a radiant heat oven using gas emittors would require from 7 to 11 cu. ft. of gas per cu. ft. of tunnel space, the conveyor oven would do the same work with the gas consumption on a similar basis of 0.22 to 0.69 cu. ft./cu. ft. of tunnel space. There is here a direct conflict of opinion which will no doubt be cleared up in due course by the Gas Research Board. The most that can be said at this juncture is that each project must be individually investigated to ascertain whether radiant heating or convection heating will give the best results. So far as radiation is concerned the report of the Gas Research Board previously mentioned states that "in the majority of the applications of radiant heating so far examined, the opacity of the materials concerned must result in surface absorption of the incident radiation, irrespective of the wave-lengths employed. In this respect, therefore, the quality of the radiation used is of no consequence and whether electric or gas-heated sources are preferable in such cases is largely a question of which will provide the necessary intensity of radiation for the lowest capital and running costs."

It may be mentioned here that the curing of paints and the polymerisation of plastics are by no means the only application of radiant heating which is also being applied to the drying of comparatively thin articles, less than 1-1¼ in. in maximum total thickness. The evaporation of water, however, seems to be an operation for which other drying systems are generally better equipped.

Spray and Roller Drying

Spray and roller drying for the purpose of evaporating to dryness were described by Mr. E. H. Farmer and Mr. C. G. Six, of Glaxo Laboratories. The authors point out that the meaning of the expression "evaporate to dryness" is by no means as simple on the large scale as might be expected. When the problem is merely to recover a solid which will crystallise readily from a concentrated solution, the obvious procedure is to remove water in an evaporator and to allow crystallisation in the same or a different vessel. Where, however, it is necessary to handle a liquid that can be dried down into a solid condition without crystallising, the problem is very different. If evaporation is carried out in pans or trays it is usually slow and difficult to control, and may be attended by gross wastage of labour in removing the dried material. Moreover, if the product is sensitive to heat, drying in pans or trays will often cause damage. To overcome these difficulties recourse is often had to roller drying or spray drying.

Roller drying consists in the application of the substance to be dried in a thin film to the smooth surface of a continuously rotating heated metal drum. Drying is

completed in less than one revolution of the drum, and the dried material is continuously scraped off the drum by a stationary knife, known as a "doctor" knife. Roller dryers may comprise single or multiple drums. For drying most liquids one or two drums are usually employed; in the paper industry large numbers are used. Almost always the drums are heated by steam under pressure. The roller dryer will always be popular because of its relatively low initial cost, space-saving, compactness, and simplicity and economy of operation with the minimum of accessory plant likely to introduce complications. With the conditions of operation properly worked out it is capable of a very high evaporation rate and low steam consumption.

The steam consumption of a well-arranged roller dryer should not exceed 1.5 lb. per lb. of water evaporated. The capacity will vary considerably with the nature of the material being dried and may be as much as 8 lb. of water evaporated per sq. ft. of drum surface per hour. The most important variable to be fixed in roller drying is the thickness of the film of liquid carried round on the roller. On a single drum machine the thickness of the film is usually adjusted by means of an additional small spreading roller. Double roller machines are usually arranged so that the drums revolve in opposite directions, turning downwards towards each other when viewed from above, and the gap between the rollers is adjusted to give the desired film thickness.

Three Related Variables

As the drying period is limited to the journey of the film between the feed and the scraper, usually less than three-quarters of a complete revoluton, it is clear that the steam pressure, film thickness, and drum speed are three related variables controlling drying for any given diameter of drum. The steam pressure may be determined by external factors, such as the availability of pass-out steam from electric power units. It is generally possible to dry successfully by means of steam at a pressure of 15 lb. to 20 lb. per sq. in., but the low output means heavy capital cost in drying equipment. Higher steam pressures involve a saving in the size of plant, but may introduce complications if the material is heat-sensitive.

Most drying operations are carried out at steam pressures between 50 lb. per sq. in. and 100 lb. per sq. in. Milk dryers usually operate at 15-16 r.p.m. Other products may require speeds as low as 1½ r.p.m. For general purposes a variable speed gear is desirable. The consistency of the mix fed to the machine is important. If it is too thick it may be difficult to obtain a uniform and thin film. Uniformity of moisture content and of composition, with heat-sensitive materials, depends on the maintenance of a uniform film thickness. The uniformity of the film is affected by the uniformity of the clearance between the drums over their entire length, by uniformity of level in the trough, by uniformity of the feed, and by the efficiency of removal of the dried film. As the drums bulge slightly under pressure, low steam pressures are an advantage in ensuring a uniform film.

Removal of Air

The air entrapped in the drum and the steam condensate must both be continuously removed to maintain thermal efficiency. One per cent of air in the drum may reduce heat transfer by as much as 11 per cent. The importance of correct choice of steam pressures and roller speeds, the correct selection and careful maintenance of film thickness, and the maintenance of the whole plant in good condition are basic principles of fuel efficiency in roller drying. In addition the use of sufficiently high steam pressure in the boiler should always be considered in order to enable a steam-driven generator to be used, exhausting or passing out steam at the pressure required by the dryers.

It is commonly found that the whole of the power required for driving the dryers and auxiliary equipment can be obtained in this way from a back-pressure engine exhausting at, say, 50 lb. per sq. in., with an initial boiler pressure not higher than 200 lb. per sq. in. It may be practicable and desirable to increase the throughput of the drums by pre-heating the liquor to be dried, and this can be achieved either by utilising the condensate from the drums or by steam heating. Whichever course is followed the condensate from the drums should be utilised for boiler feeding, appropriate steps being taken to avoid, as far as possible, loss of heat in "flash steam." Attention should, of course, be given to efficient lagging and to the choice of steam lines and valves of adequate diameter. It is not unusual to find cheap and inefficient reducing valves on each individual machine when one relay-operated reducing valve serving a whole battery of machines would represent little more in capital expenditure, but would make for better control and consequently would save steam. A good flow of air over the drum often enables the machine to work with considerably lower steam pressures.

The authors do not appear to be greatly in favour of vacuum drum dryers and they point out that the temperature of the dried solid may approach that of the heating medium in a vacuum dryer just as in a dryer operating at atmospheric temperature. In an ordinary twin roller dryer the time of contact is normally very small, and heat-sensitive materials can usually be dried without damage. For example, unequivocal tests have demonstrated that no appreciable destruction of Vitamin C, the most heat-

sensitive of the known vitamins present, occurs when milk is dried by the roller process.

The spray dryer is a versatile plant which can be adapted to a great variety of conditions and substances. It is particularly suitable for the drying of heat-sensitive materials and products required as fine free-flowing powders with fixed limits of moisture content.

Little Difference

There is often little to choose between spray drying and drum drying. The drying time is much shorter for spray drying, about 0.1 secs., compared with 2-3 sec. for drum drying. The surface in contact with the hot drum is hotter than the exposed surface of the material, and the product from the drum usually needs to be ground and sieved. On the other hand the drum dryer has a better thermal efficiency amounting to about $1\frac{1}{4}$ lb. of steam per lb. of water evaporated compared with 2-5 lb. of steam for the commercially available spray dryers. Moreover, the drum dryer is capable of drying types of material like thick pastes and fibrous slurries which are extremely difficult to spray dry. There is little difference in capital cost for large installations, but the drum dryer is cheaper for small outputs; where the physical characteristics of the product are not of major importance it would be the better choice. The drum dryer is more economical of space, as the spray dryer requires considerable head room.

Spray dryers may be operated by direct heating in which flue gases are passed through the dryer in order to pick up the evaporated moisture, or they may be heated by air which has in turn been heated by steam or fuel in indirect heaters; much depends upon what types of fuel are available, and upon the effect on the products of any impurities that there may be in the flue gases.

Where an adequate supply of flue gas is available, heating by flue gas is undoubtedly an extremely economic method. Its chief drawback is the necessity for a very large heating surface owing to the low rate of heat transfer between the gases and the metal surfaces. It also calls for the provision of forced draught to the furnace. Serious corrosion of metal may occur if the gas is cooled to a temperature below its dew point.

The method of admitting the hot air to the drying chamber is of necessity closely related to the method adopted for atomisation of the material to be dried. Rapid and uniform contact between the hot drying air and the atomised particles has been extremely difficult to achieve in practice, and it is in this operation that great thermal losses can occur. Three atomisers are in general use, namely: (1) the pressure atomiser; (2) the compressed air atomiser; and (3) the high-speed rotary disc atomiser. Each one of these types has both advantages and disadvantages, and careful consideraton must be given to the selection of the most suitable type for the particular material to be dried.

The most general primary cause of low efficiency is the coarseness or unevenness in size of the sprayed particles. The drying time of a particle increases with the square of its diameter, and its speed of fall also increases with the square of its diameter, so that an increase in particle size rapidly decreases the rate of drying and also the time available to dry. This effect of the particle size on the rate of drying shows how important is the function of the atomiser, for even if the majority of the particles are of the right size a few larger ones will compel an uneconomical adjustment of the drying conditions to deal with them.

In general, the bulk of the dry material settles out in the drying chamber, where there are facilities for its removal. The air from this chamber then passes through a cyclone or multiple cyclones, and finally through a dust filter which removes the last of the dust. The dust filter may be replaced by a spray tower or by an electrostatic precipitator. In practice there does not seem to be any necessity to use cyclones followed by dust filters. Dust filters are designed on the basis of air throughput alone and consequently no reduction in size would be achieved by prior removal of the greater part of the dust in a cyclone. The principal disadvantage of the cyclone, and more especially of the small multiple units, is that they cause considerable heat losses. Elimination of the cyclone conserves heat, and the increased dust supply to the dust filters need cause no inconvenience if they are of the modern automatic type.

Recoverable Heat Negligible

In an economical plant working with non-hygroscopic material, the air should leave the drying chamber at about 70°C, with a relative humidity of 30 per cent, the dew point of which is 47°C. The recoverable heat is negligible. For this reason recirculation or partial recirculation of the air is not economically justifiable except when an inert gas must be used instead of air. If recirculation is necessary the humid gas from the dryer can be passed through a condensing tower sprayed with cold water, and the cold gas then sent back to the gas heater. Little thermal economy is possible because of the low temperature differences and the very low rate of heat transference in the gas/gas system. It must be emphasised that when thermal efficiency alone is considered, the size and working conditions

of a spray dryer must be determined for every material to be dried, for it is very infrequent that a spray dryer designed and operating at optimum conditions for one material can be made to work with another substance without some loss of efficiency.

Mr. A. S. White dealt with the application of the atmospheric tray dryer to the drying of chemical products. There are many chemical products which require special drying techniques either because of their chemical nature or because of their physical nature. Many chemical products are made in quantities large enough to warrant the use of dryers specially designed for them, and these dryers are often of the continuous type.

For general utility in factories where materials are made by batch processes in relatively small quantities the atmospheric tray dryer still stands supreme despite the labour -saving claims of the small agitated dryers of the pan or cylinder type. There are hundreds of atmospheric tray dryers in this country, and there is probably no chemical works that has not at least one, and many have no other type. The paper was, therefore, confined to the atmospheric tray dryer, and in particular to the steam-heated types.

Cost of Labour

Labour is the greatest single item in the cost of tray drying, a typical division of costs being :

Labour	57.0	per cent of total cost.
Steam	38.0	,, ,, ,, ,,
Electricity	2.5	,, ,, ,, ,,
Maintenance	2.5	,, ,, ,, ,,

In many cases, too, the cost of drying is a small proportion of the total cost; it certainly is so in the organic chemical industry. Steam saving at the drying stage, therefore, has only a small influence on the cost of drying, and a negligible influence on the total cost of a product, and for these reasons there is little apparent incentive for improvement in steam efficiencies. However, "every little helps," and the author discussed briefly some factors in design and operation which affect steam usage.

It is difficult to establish a universal criterion of efficiency; thermal efficiency varies widely according to the degree of dryness required in the product and also on drying temperature. Steam consumption can range from about 2 lb. steam/lb. water evaporated for material dried at 100°C. to 2-3 per cent moisture content to 6-8 per cent or even higher for material dried to 0.1 per cent moisture.

Thermostatic control is, of course, very desirable and the air-operated types are to be preferred especially for dryers in which the drying temperature is changed frequently, although the direct or relay-operated hydrostatic types gives reasonable service. It is important that the steam valve is selected to suit the load, and in some cases it is best to by-pass the thermostat control during the heating-up period.

Radiation losses account for a third or more of the total steam used; a four-rack dryer at 100°C. uses about 40 lb. steam/hr. to cover radiation losses. The majority of commercial dryers, however, have the economic amount of lagging, and extra lagging rarely repays its cost.

It is rarely practicable to recover heat from the air leaving the dryer, but it is obviously desirable to reduce the amount of heat lost in this way to the lowest possible quantity, and this can be done by intelligent use of the dampers. Often it is possible to work with one damper opening—the smallest—throughout the drying, but with very wet paste it may be desirable to start with a wide damper opening and then closing down after a set time.

All-Ceramic Dryers

In the standard type of dryer this procedure can be adopted without difficulty because the fans can take care of the internal air circulation whatever the proportion of air recycled. In some cases where exceptional cleanliness is required or where corrosive vapours are present, dryers of all-ceramic construction are being used in which internal recirculation is obtained by the use of a low-pressure air injector. These dryers do their job excellently; but their thermal efficiency is limited by the low entrainment of the injectors which recycle only about 25 per cent of the air; a standard type of drier recycles 75 per cent or more.

Damper control from the humidity of the exit is only worth-while when the drying characteristic of the products require humidity control, and such control is rarely required in the drying of chemicals.

The principal defect of the atmospheric tray dryer is that drying is not uniform throughout the dryer; some trays dry long before others, *e.g.*, in a pigment drying at 100°C. some trays were dry enough after 36 hours, but the bulk required 48 hours. The usual cause of this effect is non-uniform distribution of air; the use of adjustable louvres to equalise air distribution has some effect, but by no means overcomes the difficulty. Increase in air velocity at the expense of increase in power consumption also has some effect, but air velocity is frequently limited by the dusting characteristics of the product, and for general purposes no alteration in air velocity is permissible.

In low-temperature drying, non-uniformity of drying and sometimes spoilage of product can be attributed to direct radiation from the heating elements. External air heaters are the best solution, although hot-water heating can be used as an expedient. Improvement in uniformity of drying really

requires drastic re-design, and can hardly be achieved without increasing dryer cost. Heat is lost in heating up the dryer and its charge and is not recoverable at the end of the drying operation; it is obviously best to use the largest practicable charge. Trays should be loaded uniformly, and although one would expect an optimum charge it is often found in practice that drying time, especially at high temperatures (100°C.), is roughly proportional to tray loading.

The foregoing points deal with design and operation, and it is unnecessary to mention that the heating of dryers can often be done with exhaust steam at 10-20 lb./sq. in. gauge or even with hot-condensate where low temperatures are required.

Biggest Savings

The biggest savings in steam and in over-all drying cost can be obtained by reducing the amount of water charged to the dryer, *i.e.*, by increasing the solid content of the charge. Not only is there a steam saving, but an increase in dryer output too, *e.g.*, the total cost of drying varies inversely as about the 1.25 power of the solids content of the paste for the drying of dyestuffs and pigments at 100°C. A study of precipitation and filtration conditions to reduce the mosture content of the paste is therefore the most fruitful line for the chemical manufacturer to follow and offers more than mere improvement in dryer efficiency.

Something should be said about the "through-circulation" dryer, *i.e.*, a dryer in which hot air is passed through the mass instead of over it. This type of dryer gives much shorter drying times than the conventional tray type because evaporation of water or solvent is not controlled by diffusion or capillarity to anything like the extent that it is with the latter type. Thus, the heat losses by radiation, etc., are a much smaller proportion of the total heat used—in ordinary tray dryers the amount of water evaporated towards the end of the drying operation is very small compared with the steam used. The through circulation technique, familiar in the Quinan and some commercial forms of band dryer, is, however, applicable only to crystalline materials or to materials which can be granulated or otherwise made into small lumps. A batch dryer of this type should be particularly useful and give good thermal efficiencies for the low temperature drying of small production materials.

China clay is a substance requiring special technique for drying, and this was discussed by Mr. C. R. Love. In years just prior to 1939, production of china clay reached 850,000 tons per annum, and is expected to exceed this figure in the near future. The coal consumption for this output exceeds 100,000 tons a year, and is an important item in the cost of production. In the early stages the process is entirely wet, and dewatering proceeds by gravity or by pressure filtration to the point where heat is applied to obtain the required degree of dryness. About 85 per cent of the total output is dried to 10 per cent moisture and 15 per cent to 1 per cent moisture for disintegration and bagging as a powder, and it should be borne in mind that the cost of drying must be reckoned in shillings per ton of product. It is therefore not possible to introduce intermediate losses such as are associated with electricity or gas into the process.

The fine particle size, which in certain grades is 55 per cent below 1 micron, and the need to avoid calcination by high temperature, impose certain limitations on the methods adopted. The combined moisture begins to disperse at temperatures around 400°F., and this must be retained.

The older and still the principle method of drying is to settle the clay from a thin slurry to a semi-plastic state containing 45-50 per cent of water in large rectangular tanks arranged alongside a drying floor, which is generally 250-300 ft. long by 15-18 ft. wide, on the opposite side of which, at a lower level, is the dry store. The drying floor is composed of porous firebrick tiles laid on flues, which are heated by hand-fired coking-type furnaces; the length of flue is sufficient to reduce gases to 250°F. when correct conditions are observed. The semi-plastic clay is laid on the hot floor and makes a bed in complete contact with the tiles. Evaporation proceeds partly by evaporation above the bed and partly in the flue by seepage of moisture through the tile.

Filter Press

Using a high volatile large coal it was possible to obtain overall efficiency of 50 per cent when drying the clay from initial moisture of 45-50 per cent to 10 per cent, but inferior fuels have led to less satisfactory results. Hand labour with scoop, shovel, and wagon is used entirely in these kilns. A later development now being rapidly extended is the use of the filter press to replace the settling tank. This cuts out the settling period of several weeks, and consequent chance of contamination, and reduces the moisture content to 28-33 per cent, according to the particle size and other qualities of the clay.

The filter press cakes do not make complete contact with the hot floor and the heat efficiency is reduced to 38 per cent, but in spite of this there is a reduction in the fuel consumption by 40 per cent. The main concern here is fuel economy, but the producer cannot disregard other factors in the total cost.

An economy in fuel has been affected by filtration, but only by the introduction of other factors, and by the use of scarce com-

modities such as labour, cotton cloth, and iron castings, and by use of power for pumping the clay slurry to the filters at 100 lb. per sq. in. The result shows no overall economy over the old methods.

The ever-increasing demand for powdered clay calls for drying to 1 per cent moisture, and for this purpose the hot floor is quite unsatisfactory owing to the need to reduce the temperature to avoid calcination and consequent loss in output. The extra fuel is out of proportion to the small reduction in moisture.

The designer, then, is faced with two main problems :

(1) To reduce labour costs by introducing mechanical handling of the wet filter press cake to continuous dryers, and thence to store.

(2) To find a high efficiency dryer mainly for the total drying of clay for disintegration, but also capable of use for bulk clay dried to 10 per cent. moisture.

Machine Problem

Considerable exploration has been undertaken in both these directions during the last few years. For the first objective an indirectly-fired rotary kiln was required, and it appeared that no such machine was readily obtainable in this country, and an American design had to be built. Difficulties in cutting the clay to suitable sizes and feeding continuously were overcome, and fuel consumption has been ascertained under normal conditions.

Using a hand-fired coke furnace the efficiency is not better than the hot floor, *i.e.*, about 38 per cent, from which has to be deducted the power for driving the kiln and its auxiliaries, which is considerable. A large machine with chain-grate stoker using small coal is now nearing completion, and it is hoped that the superior control of combustion and temperature will lead to good results.

For the second problem low temperature is essential and here again a suitable machine was difficult to obtain. Tests were carried out on a steam-heated rotating shelf machine constructed of a number of shelves with segmental trays. Within the shelf system blowers are located, and the heating elements are arranged around the outer periphery of the dryer. Multiple circulation and reheating of the air is effected by the blowers, and complete drying is assisted by repeated turning of the material as it progresses from shelf to shelf on its passage through the machine.

The quantity of hot vapour escaping to atmosphere is controlled according to humidity, and efficiencies of 70 per cent based on steam consumption to moisture evaporated were obtained when drying to 10 per cent moisture, and of 50 per cent when drying to 1 per cent moisture. The power consumption of this dryer is low. These results were obtained using steam at 60 lb. g., but there is reason to believe that much lower pressures can be used at the cost of reduced output from a dryer of a given size.

At all stages of production electric power is used and it is found that a very close balance exists between the power requirements and that which can be produced by a correct choice of initial pressure to the turbines and heating steam pressure when using back pressure or pass out turbines. The obvious course to adopt, therefore, is to install electric power plant and dryers adjacent to each other and choose steam conditions most suited to the combination. A large plant on these lines is now in course of construction making use of drying units of 7½ tons per hour each from which the maximum heat efficiency is expected. Calculation shows that 35 per cent to 40 per cent of the total fuel bill can be saved by the adoption of this method.

Considerable practical difficulties must be overcome to concentrate the drying and storage capacity into sufficiently large units to make this scheme applicable to the whole industry, but there is no doubt that along these lines lies the possibility of achieving those economies in fuel which are of such paramount importance to all industrial undertakings where fuel is a large item in their general costs as well as to our country as a whole.

Non-Ferrous Metals

Consumption in the Third Quarter

DETAILED figures of consumption of non-ferrous metals in the U.K. during the third quarter of 1946 covering zinc, lead, tin, cadmium, and antimony, have been issued by the Ministry of Supply Directorate of Non-Ferrous Metals, together with tables showing consumption of virgin metals and scrap for the various trades. Total figures, in long tons, of the consumption of virgin metal in the first, second, and third quarters of 1946 are as follows :

	First Quarter	*Second Quarter*	*Third Quarter*
Zinc	50,653	51,548	53,865
Lead	55,426	48,013	45,913
Tin	5421	6449	6593
Cadmium	127	138	144
Antimony	1490	1274	1532

Consumption of scrap metal in the third quarter, in addition to the above, was (in long tons) as follows: zinc (including re-melted), 18,312; lead (including lead refined in the U.K. from scrap and home-produced ores), 33,142; tin, 1796; antimony, 820.

B.A.C. Ballot

Result Against Affiliation with T.U.C.

THE result of the ballot recently conducted among members of the British Association of Chemists on the question of whether the Association should, or should not, affiliate with the Trades Union Congress, has been announced as follows: For, 557; against, 581. This gives a majority of 24 votes against affiliation.

In this connection we have received the following letter to the editor:

SIR,—The publicity which you have accorded the ballot recently held by the British Association of Chemists on the question of affiliation to the T.U.C. is most welcome, but it is important that the matter should be viewed in correct perspective. Chemists have treated this issue as a political one and the voting has been roughly on the same lines as at the General Election. Were any other chemical body to put the same question to its members it is doubtful whether the result would have been markedly different.

Twenty-eight years ago the British Association of Chemists was formed to serve the economic interests of chemists. It was hoped that on this aspect chemists might be persuaded to unite and support one body in such numbers as would enable it to speak with authority for the profession. Its three grades of membership cater for all types of chemists. It became a trade union in order that it might enjoy certain legal rights to negotiate on behalf of chemists. It established an unemployment fund to protect chemists in times of depression. No other chemical body has such a fund, which to-day has a reserve of £41,000 with which to support such of its members who might otherwise be compelled to accept positions on terms that might depress the general level of salaries of all chemists. Its appointments list may fairly be claimed to be the most comprehensive list available to chemists. By means of its legal aid fund it has established valuable legal precedents on behalf of chemists.

The British Association of Chemists has consistently encouraged its members to support other chemical bodies. It has pursued a policy of moderation and has sought to unite all chemists in a common policy and to collaborate with other chemical bodies to this end. For many years the B.A.C. advocated the formation of a comprehensive register of chemists: not necessarily its own register, but one which would embrace all chemists. In the absence of such a register, the Government found it necessary to establish the Central Technical Register, which is not under the control of any of the chemical bodies. Thus, what chemists failed to do voluntarily has been thrust upon them from above. In these days of pressure groups and extremist activities, it is permissible to speculate in what other ways the interests of chemists may be assailed under the stress of economic or political events. Every passing year renders the unification process more difficult of attainment, and increases the chance of chemists being squeezed between rival interests.

Is it not time chemists decided to be chemists first, and adjectival chemists afterwards—to put the interests of the profession as a whole to the fore, and behind a united front indulge their passion for individuality in some degree of security? Instead of splitting the profession, may we not take heart and make this ballot the stepping-stone to higher things? If chemists will act now they may be assured that they have the fullest opportunity of controlling the policy of a body of their own choice. If not, they can hardly complain if they lose control of their own destiny.—Yours faithfully,

H. L. HOWARD,
Hon. Registrar, British Association of Chemists.

London, W.1.

Seaweed Industry

Large Scale Scottish Experiment

IT was reported from Inverness last week that the Treasury has authorised the expenditure of £5000 for the purpose of carrying out a large-scale experiment in the collection and drying of seaweed. The experiment, which will take place at Lochmaddy, North Uist, will be carried out over 20 weeks.

A start will be made early in March, it is hoped, and already boats and other items of equipment have been secured. It is estimated that there is in the area of Lochmaddy and Loch Eport 60,000 tons of seaweed available for cutting. If the experiment proves commercially successful a recommendation to establish a factory at Lochmaddy may be put forward. The proposed factory would be responsible for cutting, drying, and grinding seaweed, and would give employment to many people in North Uist.

During the war extensive use of seaweed extracts was made by the Scottish Seaweed Research Association. This body will carry out the experiment at Lochmaddy, on the recommendation of the Scottish Provisional Seaweeds Committee set up by the Secretary of State for Scotland last December.

A wide field is covered by the products of Venner Time Switches, Ltd., Kingston-by-pass Road, New Malden, Surrey. Several meters and gauges of particular interest to the chemical manufacturer are described and illustrated in the latest price list.

SAFETY FIRST

Amenity as a Feature of Chemical Works—IV

by JOHN CREEVEY

THE Minister of Transport, with the authority of Parliament, has recently distributed copies of the revised Highway Code for the guidance and safety of all road users. In his foreword he tells us that " in every human activity there is a standard of conduct to which, in the common interest, we are expected to conform "; and adds that the provisions of this Code are a simple summary of the best and widest experience, and each provision, whether it relates to a legal requirement or to discretionary behaviour, has been included because of its importance in preventing road accidents.

Considered apart from the question of road safety, this Highway Code may profitably be studied by employers and employees alike in every industrial environment, for a little commonsense thinking will point out analogies. For instance, under the heading of " Hints on Cycling " we are reminded that a bicycle is not in good condition if, among other things, the wheels are out of line, the chain is slack, or the tyres are badly worn or soft. It is the same with machinery; to be safe for those who are in contact with it, machinery must be kept in good running order. Moreover, the nature of the machinery must be perfectly understood by those who attend it, by those who undertake the maintenance of its good working condition, and by those who are responsible for seeing that safeguards against accident are properly installed and that the correct procedure is observed in their operation.

Workers' Comfort

But even with due attention to all points of maintenance and operation, and with extensive education of the worker in measures of safety, it might still be difficult to attain the ideal achievement of complete freedom from accidents if attention was never given to this sense of things which may be summed up under the word " amenities."

Men—and women—work best when they have a certain measure of comfort as regards the conditions under which they have to do their work. It has been within only recent years that employers have come to realise this, and in many cases have wisely taken steps to provide good working conditions, sometimes prompted, it is true, by gentle pressure from Acts and Orders formulated with the safety of the individual worker in mind.

Good artificial illumination in the absence of adequate natural daylight, and the provision of efficient ventilation which operates simultaneously with the removal of fumes detrimental to health or which are merely distasteful, are prime essentials for comfort of working, and at the present time there is no excuse for the existence of adverse conditions. Added to this, the worker needs adequate facilities for washing, not only before meals and at the end of the working shift, but perhaps at intervals more frequent according to the precise nature of his work.

Cleanliness

With good ventilation of the working space, the brain becomes more alert, and even in this way alone the incidence of accidents is noticeably reduced. Freshness, acquired by washing the hands and face, is also a great tonic to the worker, especially in certain aspects of industry; he is an unwise employer who denies the worker the fullest facilities for washing himself during working hours as well as immediately before meals and at the end of the shift. The washing needs of the individual, however, do not stand alone; there is also the necessity to clean the environment in which the worker moves in the course of attending to his duties. In certain cases this matter of environment is more acute than it is elsewhere; the need to clean-up may come only at the end of the shift, at other places more frequently, and the cleaning may include washing down the floor, as well as parts of the plant.

Only when executives make periodical tours of inspection, or better still, actually engage in routine work about the plant, are they able to realise this need for cleaning-up and the manner in which the ultimate environment increases the efficiency of the worker. Even the worker who is regarded as habitually lazy shows evidence of improving as a result of a clean environment, and will develop into an asset after due measure of time.

Apart from those points which have been mentioned—ventilation, lighting, washing facilities, and facilities for taking meals under safe and comfortable conditions—there is another matter which does not receive all the consideration it demands. This is the internal decoration of the various buildings which comprise the works, and the

upkeep of the works generally. A little more attention devoted to the yards, roadways, and spaces between buildings, would make many works far more pleasant than they are at present. It is true, of course, that wartime conditions of working, and perhaps restricted accommodation following war damage, have prevented recent attention to cleaning-up the works site, but it is significant that certain industrial concerns which in pre-war years devoted much time and money to providing a pleasant outside environment have been foremost in the work of re-establishing pleasant conditions after nearly six years of activity in the war effort.

Pleasing Colours

As regards the interior of individual buildings, the judicious application of paint and distemper in pleasing colours has already been proved to have a good psychological effect upon the workers, but its advantage does not end there. The freshness of the walls of a building, finished in light colour, aids materially in the distribution of light, both natural and artificial. To reach high efficiency, the actual tint should be chosen with due regard to the nature of the work carried on, the relative concentration of work-benches, and stacked material, and the extent to which natural daylight gains admittance or artificial light is provided. Before selecting any particular colour, it is wise to consult the firm which installed the artificial lighting, for their experience in these things is not to be ignored.

There is a vast difference between plant which is poorly lighted and that which has artificial illumination on scientific lines. Yet, all the same, the good work of the illuminating engineer may be wrecked by the application of colour entirely unsuitable for the lighting installed. Likewise, let it be remembered that the so-called "modern" or fluorescent lighting is not all that it has been claimed to be. Already, in street lighting, experience has shown that "blind" spots results, but worse still is the cumulative effect of permanent injury to the eyes of a proportion of persons who have to work where that type of lighting is installed.

Lighting needs proper maintenance. Although an artificial lighting system may be perfectly adequate when first installed, it will soon deteriorate in the absence of proper maintenance. Walls and ceilings, including roof steelwork, should be painted at regular intervals, and preferably in a light tone of colour. For the fullest admittance of natural daylight, windows and roof-lights must be kept clean, outside as well as inside. With artificial lighting, there must be immediate replacement of bulbs and tubes when their efficiency drops below a certain minimum.

In all works with a large number of lighting points, it is wise to have means for checking the foot-candles of illumination received at any particular point, both inside the buildings and outside. The use of a foot-candle meter will automatically reveal the combined effect of all possible aspects of deterioration in artificial illumination. The cause of inadequate maintenance is generally ignorance of the extent of that deterioration; the result of deterioration undetected is loss of alertness on the part of workers, and accidents are likely to follow. Apart from accidents, deterioration in lighting has a depressing effect upon the worker, and may also become just as irritating as glare and other defects of a lighting system which has been badly installed.

In those cases where discrimination of detail is not essential, as in the work of handling material of a coarse nature, in grinding clay products, in handling ash, and in the charging of furnaces, the illumination demanded as a minimum is of the order of 3 to 5 foot-candles. Where moderate discrimination of detail is essential, as in such work as fine core making in foundries, the minimum is 10 to 15 foot-candles. These values are given only as examples of minimum illumination; the intensity of the lighting which is desirable for a particular operation is best determined by experience, thenceforth adhering to the value so found. Elderly persons, and persons with defective eyesight, always need more light than do persons with normally perfect vision.

BRITISH GAS COUNCIL

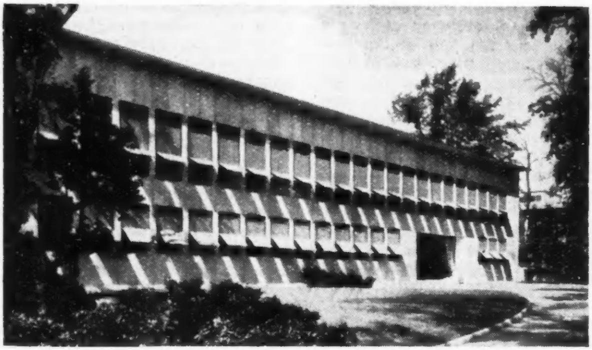
With the object of taking over all or part of the assets and liabilities of the unincorporated British Commercial Gas Association and National Gas Council of Great Britain and Ireland, the British Gas Council has been registered as a company, limited by guarantee without share capital. The original number of members is 1500, each liable for £1 in the event of winding-up. By Board of Trade licence, the word "Limited" is omitted from the title.

The Directors are Mr. R. J. Auckland, manager and secretary of Cardiff Gas, Light & Coke Co., Ltd.; Mr. Tom Brown, managing director of South Suburban Gas Co.; and directors or officials of the following: United Kingdom Gas Corporation, Ltd; Swindon United Gas Co.; Newcastle-on-Tyne and Gateshead Gas Co.; Bradford Corporation Gas Department; South Metropolitan Gas Co.; Helensburgh Town Council Gas Department; City of Leeds Gas Department; Tottenham and District Gas Co.; Gas, Light and Coke Co.; Torquay and Paignton Gas Co.; and Southampton Gas, Light and Coke Co.

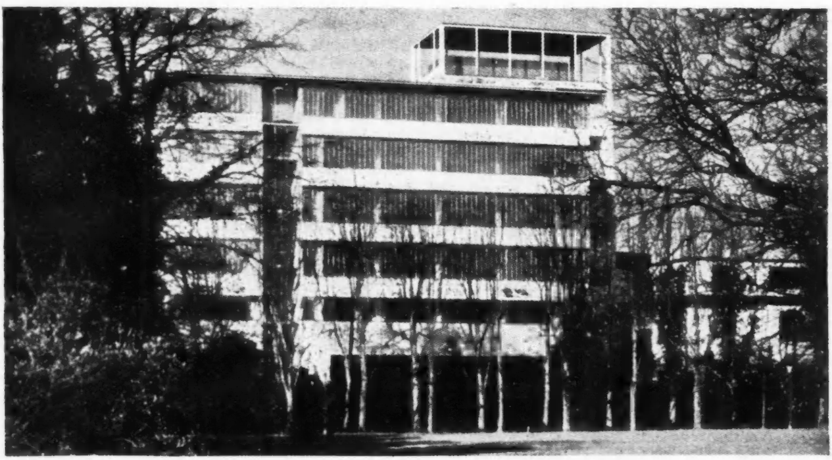
The general manager is Mr. J. R. W. Alexander; and the registered office is at 1 Grosvenor Place, London, S.W.1.

Swiss Laboratories

Striking Examples of Modern Architecture



Modern trends in Swiss architecture are admirably illustrated in these photographs of the laboratories of Hoffman—La Roche & Co., A.G., at Basle, the architect for which was the late Professor O. R. Salvisberg, of Zurich. The lower photograph was shown at the Exhibition of Planning and Building recently held in London under the auspices of the Royal Institute of British Architects.



British Paints for Abroad

Serious Decline in Export Values

PAINT manufacturers in this country are losing their overseas markets, according to a statement issued by the Paint Marketing Council. As a result of the shortage of raw materials for the paint industry, in particular linseed oil, manufacturers of paints and varnishes can execute only a fraction of their orders from India, the Middle East, South Africa, Latin America, the continent of Europe, and other overseas markets. The pre-war value of Britain's export trade in paints, varnishes and kindred products was approximately £4,000,000 a year. As a result of the present raw material restrictions, this figure is considered likely to drop to an annual rate of £500,000 or less for the current year.

"We are facing a very serious situation indeed, and are in danger of losing markets which have taken a century to build up," stated the secretary of the Paint Export Group. "Paints and varnishes made in Great Britain have long been acclaimed as second to none in quality in the markets of the world, but we may lose all this valuable trade, and the prestige that goes with it, unless raw material supplies to us can be substantially increased at an early date."

Before the last war, British manufacturers of paints and varnishes sent their products to every part of the world. Expert British chemists and research workers were constantly experimenting to produce paints and varnishes for every climatic variation.

Competition Overcome

Great Britain's best pre-war customers were India, the British Colonies, Latin America, South Africa, the Middle East, and some of the European countries, Scandinavia, Portugal, and Switzerland being among the best. Germany, Holland, Belgium, and France made practically all their own paints and varnishes. U.K. paints sent elsewhere in the world were able to surmount keen competition through their excellent quality. Even Canada, almost entirely self-supporting in paints and varnishes, bought from Great Britain certain specialised products of the paint industry.

U.K. manufacturers of paints for export suffered a drastic cut in their allocation of linseed oil in the Summer of 1946. "The result of this cut," said the secretary of the Export Group, "was to reduce by 75 per cent the volume and value of the trade we were doing in the first post-war year, and which, in turn, was approximately half the value of our pre-war trade. This restriction in raw materials to the export side of the industry at the present time is particularly unfortunate, as British manufacturers were confidently looking forward at the end of the war to extending all markets and capturing new ones. With this purpose in view many directors and other executives of exporting houses have made extensive journeys abroad, and have returned only to find that they are unable to execute orders recently secured. As a result, the goodwill which has been enjoyed for many years in overseas markets has been jeopardised."

A New Threat

"There is a strong likelihood that if Britain cannot supply paints in the near future she will lose an immense amount of export trade to local competition in many of her former markets. The Argentine, for instance, has plenty of money to develop her own paint industry, and, still more important, she is perhaps the world's largest producer of linseed, much of which she is crushing locally. Her technique in high-grade paints and varnishes is in no sense comparable to that of the U.K. paint industry, but many of the goods she produces will be satisfactory for her local demands."

The U.K. paint industry has, during the last 100 years, trained and employed the best types of overseas agents and representatives who, through dealing in products of undoubted quality, have been able to give excellent servicing arrangements to their customers. Now, with no British goods to sell, they must—in order to earn a living—offer their services either to local manufacturers or to foreign competitors who are very anxious to employ them, but may stipulate as a condition of employment that when Britain is in a better position than at present to ship large quantities of goods, these men must not return to the employment of U.K. paint firms. Once this valuable network of overseas agents and representatives is lost to the U.K. exporter, it will be well-nigh impossible to re-establish an export trade in paints and varnishes.

"Paints and varnishes," said the secretary of the Export Group, "are an ideal type of export, as they earn a very good profit for British labour and capital, and pay high shipping rates. They were—and are—the best of their kind, the result of years of patient and highly-skilled research. Unless the U.K. paint and varnish industry can be assured by the British Government of a more generous allocation of raw materials for paint and varnish exports in the immediate future, it will lose permanently this very valuable trade and the excellent goodwill that has accompanied it."

Anti-Corrosive Materials

Wide Use of Plastics of the Vinidur and Oppanol Type

ALTHOUGH German plastics have figured rather frequently of late in the technical press, largely on the basis of several British and American intelligence reports, little has so far been said about the increasing use of the poly-vinyl-chloride (Vinidur) and polyisobutylene (Oppanol) groups, especially as anti-corrosives in a wide range of applications.

The former, Vinidur group, is probably the better known of the two, and finds a place in most modern books on plastics. For example, H. Barron in "Modern Plastics," 1946, says that, in Germany, various forms of straight poly-vinyl-chloride under names such as Astralon, Gutta-syn, Vinidur, etc., are used for covering cable, making tubes for numerous industrial uses, transparent sheets, etc. (Astralon is the principal transparent form). This author adds that Vinidur is the material most widely used for anti-corrosive purposes and for replacing rubber and metals. It has a specific gravity of 1.38 and a comparatively low softening point, 80° C. It is non-inflammable; odourless and tasteless; its tensile strength is 600 kg/cm², and the bending strength is more than 150 kg./cm². Up to 40° it is resistant to water, alkalies, mineral and some other acids, but not to aromatic hydrocarbons (benzene, toluene), ether, esters, ketones, and several chlorinated hydrocarbons.

In the field of co-polymers the Germans have prepared vinyl chloride and acrylic ester derivatives, the principal being Mipolam. This, indeed, as well as the Vinidur and Oppanol groups, is largely a development of one or more of the well-known I.G. Igelits introduced several years ago.

Comprehensive Survey

Any gaps there may have been in our knowledge of these products have now been abundantly filled by a comparatively new book edited by Dr. Walter Kranich and published by J. F. Lehmanns Verlag, of Munich and Berlin, in 1943. This is "Materials for Corrosion Protection," and is a handbook for Vinidur and Oppanol. In over 400 pages, well illustrated, the book gives a comprehensive survey of the production, properties, and uses of these two groups and some related products, with special reference to anti-corrosive applications and war-time uses—which were many.

The original Igelits (PCU and MP), together with Oppanol B200, have been developed in various directions and now comprise groups which may be roughly classified as (1) Vinidur products, (2) Astralon products, (3) Soft Igelit products, and (4) Oppanol products. The trade name Igelit is retained for a member of the first group, which also includes other trade names which may or may not be registered trade marks, such as Decelith, Mipolam, etc. The Vinidur group is manufactured in a great variety of forms, chiefly tube, rod, sheet, and foil (for linings and textiles). The Astralon group is derived from the Igelit MP (mixed polymerisate), and includes special purpose products in virtue of their transparency and non-colouring under heat treatment. The soft Igelit group is derived from the original Igelit PCU, by addition of suitable softening agents, for use as soft rubber substitutes and other purposes. The various softening agents added to either Igelit paste or powder include T.C.P. (tricresyl-phosphate)-G, Mesamoll, Palatinol AG, HS, and K, and for low temperature work Palatinol F, KF, and Elaol I. The Oppanol group comprises chiefly Oppanol-O, Oppanol-ORG, Oppanol-OG, and Dynagen, prepared from the original Oppanol-B200 (polymerised isobutylene).

Further Details

In Part 3 of the book, W. Buchmann, of Bitterfeld, treats in considerable detail of the molecular structure and formation of these various products—except the fourth group, which is left to A. Schwarz and W. Daniell. Dr. Kranich adds an elaborate table of some thirteen pages giving a considerable list of chemicals, chemical preparations, both gaseous and liquid, against which these various plastics are more or less resistant at specific temperatures and under varying concentrations.

The fourth section is devoted to manufactured products and copiously illustrates those operations which are "chip-raising," i.e., those which involve loss of material as chippings, or dust, such as sawing, boring, lapping, etc., and those which do not involve loss of material, such as pressings and stampings. Various methods of joining are included.

The section on industrial and scientific applications is of considerable interest, and also copiously illustrated. The Vinidur group in particular, owing to mechanical strength and stability against corrosive or other aggressive action, has been put to a remarkable number of varied uses, e.g., in chemical plant for pipe and conduit systems and for external cladding or internal lining of apparatus; it frequently replaces metal altogether where mechanical strains are not too onerous. Examples of these various uses are taken from many industries.

including the manufacture of artificial silk, hydrochloric acid, etc., and relevant German standard specifications (D.I.N.), governing these industrial applications of Vinidur, are frequently cited. Owing to the fact that it is odourless, tasteless, and physiologically inert, this material is particularly well suited for packaging, *e.g.*, for lining food containers.

Special attention is devoted to the best methods of lining. The Vinidur group cannot be used in solution as varnish or lacquer, as they are insoluble in the usual media; and they must therefore be applied as a coating film by means of adhesive. The thickness varies according to purpose intended, but usually should not exceed 1 mm., both on the ground of economy and to avoid risk of ripple or wave formation, or other irregularities of surface which might encourage occlusion of gases or other impurities and initiate corrosion. The temperatures to which the lining is exposed should not normally go beyond 50° C., although short temporary exposure to temperatures somewhat higher can often be tolerated without ill effect. Low temperature limits are also specified, and are usually in the neighbourhood of 0° C. For higher extremes of temperature the Vinidur lining may in some cases be considerably thicker, up to 5 mm.

Although riveted vessels can be lined if special provision is made to cover the rivet heads in such a way that they do not interfere with close and smooth adhesion, yet welded work is much more suitable. The surface to be lined must be carefully prepared, especially in regard to cleanliness and suitable roughing—to increase adhesion. This latter is best secured by sand-blasting —in the case of iron vessels, and very often also with copper or aluminium. The surface is then coated with a Zincate solution (30 per cent soda lye, 10 per cent zinc oxide, and 60 per cent water). A suitable adhesive, namely solution PC 10, is described, together with its mode of application. It must have low viscosity in order to penetrate deeply into the pores of the metal. Several coatings of adhesive may be required, and generally the amount used is 1.3-1.5 kg./m^2. In order to eliminate any residual gases these must be thoroughly driven off by heating the surface up to 140° C. before applying the Vinidur lining. This latter should also have a coating of adhesive, of slightly different composition, namely PCA 20, and likewise must be thoroughly cleaned. Detailed instructions are given for applying the lining, not only to metal, but also wood and concrete vessels. Various methods of test are described.

Other sections of the book deal with the use of these products in the electrical industries.

Water Softening Plant

A New Development

ONE of the difficulties with the ordinary continuous flow lime and soda ash softening plant is the slowness of precipitation of the calcium carbonate, and particularly of magnesium (as hydrate), a most objectionable constituent. Thus lime and soda ash plants should give at least three hours' setting, and in practice 4-5 hours is sometimes required. The slowness of precipitation throws much extra work on the filters, which therefore have to be cleaned at frequent intervals, thus causing waste of time and increase in net operating cost. Further, in order to obtain a treated water of maximum softness it is necessary in many cases to use an appreciable excess of reagent, largely due to the slowness in completing the chemical reactions.

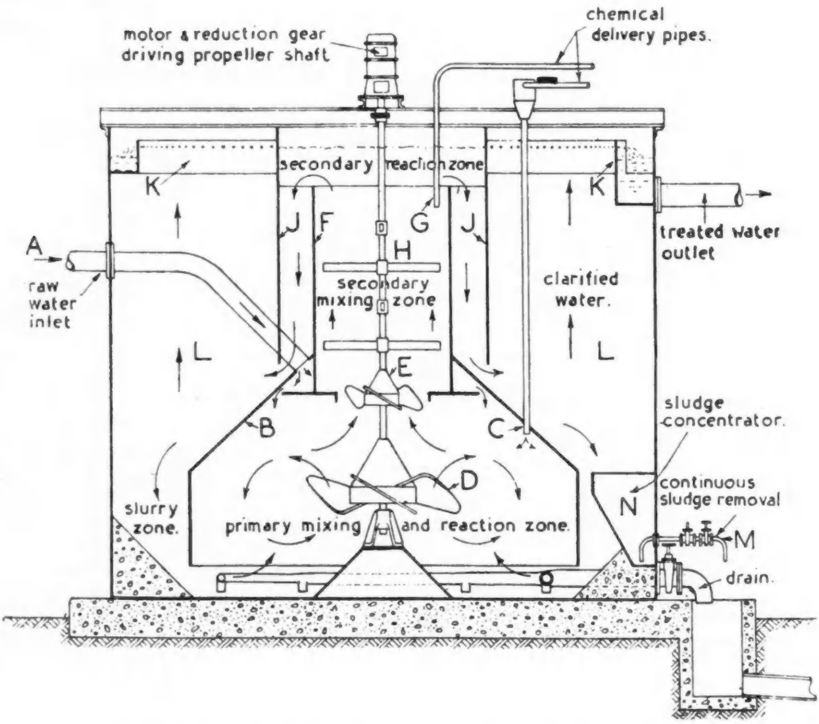
In general, two methods can be adopted to overcome these difficulties. The first is the addition of alum to the water after mixing with the reagent, so producing coagulation and much more rapid separation of the magnesium precipitate, which, in its initial stages, is in the colloidal condition, thus increasing the difficulty. The second method is known as "seeding;" a solution of some substance in water may be in the super-saturated condition, that is in a condition when crystals should separate out but do not do so for some not very clear reason. This separation of crystals from a super-saturated condition can be helped, however, by various methods, including mechanical agitation or shaking, and especially by the addition of a crystal of the substance, known as a "seed crystal," since it rapidly causes normal separation of crystals.

Calcium carbonate and magnesium hydrate sludge already formed in a softening plant have this "seed" effect upon the water under treatment, causing much more rapid gravity separation of the sludge and reducing the work thrown upon the filters. Ordinary softening plants are so operated to maintain a bed of sludge at the bottom to give this effect, which is somewhat limited, however, by lack of effective contact. Accordingly, much interest attaches to a new lime and soda ash softening plant, the "Accelator," placed on the market by the Paterson Engineering Co., Ltd., of London. The basic principle of this plant consists of the coagulant action and thorough mixing by

mechanical means of the already precipitated sludge with the softening reagent, which results in a greatly increased "seed" effect.

In general, the new plant consists of a vertical and relatively wide diameter main outer steel plate cylinder containing an inner reaction portion formed also of steel plate. The raw water enters by an inlet pipe at the side of the main cylinder and passes to what is known as the agitator hood, a circular closed chamber of wide diameter in the lower half of the main cylinder, with a top hood or cover. The upper portion or extension of this agitator is a vertical jacketed cylinder known as the secondary mixing zone, down the centre of which is a vertical paddle shaft driven by a small electric motor. The shaft is provided with agitators of the propeller type, which give a violent agitation.

The chemical reagents (lime and soda ash) enter by a pipe into the top portion of the agitator hood, and the agitator gives an instantaneous and intimate mixing of the raw water with reagents and the slurry which is forced up into the upper secondary mixing zone by the propeller agitator. At the top of the secondary mixing zone, coagulant solution (alum) is added continuously, and a more or less gentle agitation is given by the simple agitators of the bar or paddle type, operating in conjunction with baffles. The whole volume of water travels up from the agitator hood through the secondary zone and flows over at the top



Vertical section of the "Accelator" water softening plant.

A. Raw water inlet.
B. Agitator hood.
C. Reagent entry point.
D. Paddle agitator.
E. Circulating propellers.
F. Centre tube.
G. Coagulant entry pipe.
H. Bar agitators and baffles.
J. Outer downcomer tube.
K. Clear water discharge.
L. Level between sludge level and clear water.
M. Concentrated sludge discharge.
N. Concentrator trough.

of the latter and down through an outer jacket into the body of water in the main cylinder, the lower half of which constitutes the sludge settlement zone.

The pure, clarified water passes out continuously from the top of the plant. The sludge is removed continuously from the bottom of the plant by a "concentrator discharge trough," the inlet to which is about one-third of the height of the main cylinder, thus removing only the finer and lighter portions of the sludge, which have the least seeding effect. The lime cream and the soda ash solution are supplied separately to the water; there is no need to mix them first, as with ordinary lime and soda ash plant, because the resulting seeding effect of the calcium carbonate thereby formed is not required, since it is already given in most effective fashion within the plant from the sludge already present.

The net result of this "Accelator" design, according to the designers, is greatly increased efficiency, giving the maximum degree of softening, combined with extremely low excess of alkalinity, and most effective sludge separation, resulting both in a saving in chemicals and a great reduction in the washing of filtering material. Total hardness in most cases can be reduced to less than 2.5 parts per 100,000 (as calcium carbonate), with no appreciable excess of lime and soda ash reagent, combined with an extremely low alkalinity down to say 5.5 parts (as calcium carbonate) per 1,000,000 by the standard phenolphthalein alkalinity test.

Fuel Research

Training at Birmingham University

COAL utilisation and fuel technology are to receive the special attention of the newly-formed Department of Chemical Engineering at Birmingham University, according to a statement made last week by the Vice-Chancellor, Dr. Raymond Priestley. He was addressing about 130 executives from gas and allied industries who were on a visit of inspection under the auspices of the Midland Gas and Allied Industries University Collaboration Committee, and he added that if the department is to fulfil the purpose for which it was started, industrial support would be necessary for the appeal for the extension of the department.

Dr. Priestley declared that the training of and research by chemical engineers was regarded as vital to the production of high-quality goods for export. This country, he said, had exhausted, or nearly exhausted, the easiest-won of the coal and the highest grade of the iron ores which were its principal original raw material assets in industrial competition. "We have small home markets compared with our greatest competitors," he went on, "and the answers to these problems are to use our remaining resources with the greatest possible economy and ingenuity, and to produce for export goods of the highest quality. That is, we must capitalise our best brains, our national skill and the faculty for the co-ordination of hand and brain in which as a people we are endowed, I believe beyond most others, and it is in these two fields that this University plans to help.

Apart from those problems, Dr. Priestley said, there was the fundamental trouble of the nation being today one of overtired people. The industrial system was grievously ill, and the chief symptom of the disease was, apparently, an insufficient output per man hour. He hoped the University's new department of Engineering Production would help to solve that problem.

Silicon Iron Pipes

New British Standards

A NEW British standard, "Acid-Resisting Silicon Iron Pipes and Pipe Fittings" (B.S. No. 1333 : 1946), deals with the dimensions of high silicon pipes and pipe fittings from 1 in. to 12 in. nominal bore which are extensively used in chemical plant and where excessive corrosion is inevitable or anticipated. The minimum silicon content to give maximum corrosion-resisting properties is generally agreed to be 14.25 per cent.

Silicon iron is more brittle than ordinary cast iron and, in consequence, requires greater care and precaution in handling and transport. It is more difficult to cast and is more liable to porosity and distortion than ordinary cast iron. There is particular difficulty in casting silicon iron pipes with integral flanges and, in this standard, flanged pipes are specified with 45° cone ends for assembly by halved loose coupling flanges of ordinary cast iron impinging upon the 45° cone ends of the pipe.

The standard also deals with spigot and socket pipes, the spigots of which are generally similar to the end of the cone end pipes, thus allowing inter-connection between cone end and spigot and socket pipes. The sockets of the spigot and socket pipes will also accept the plain spigots of chemical stoneware pipes of the same nominal bore so allowing interconnection between silicon iron socket and stoneware spigot. The fittings included comprise elbows, bends, tees and crosses for both flanged and spigot and socket pipes.

Copies of the standard can be obtained from the British Standards Institution, 28 Victoria Street, London, S.W.1 (Price 2s.).

Sulphuric Acid Production

Quarterly Statistical Summary

THE National Sulphuric Acid Association, Ltd., 166 Piccadilly, London, W.1, has issued details relating to the production and consumption of sulphuric acid, etc., in the United Kingdom and Eire for the third quarter of 1946 and these are summarised in the following tables:

TABLE I.—SULPHURIC ACID AND OLEUM
(*Tons of 100 per cent H_2SO_4*)

	Chamber only	*Contact only*	*Chamber and Contact*
Stock, July 1, 1946 ...	34,935	30,821	65,756
Production	167,208	162,355	329,563
Receipts	39,664	25,157	64,821
Oleum feed	—	2,089	2,089
Adjustments	−218	−49	−267
Use	98,902	72,246	171,148
Despatches	108,172	124,540	232,712
Stock, Sept. 30, 1946	34,515	23,587	58,102
Total capacity represented	220,290	189,550	409,840
Percentage production	75.9	85.7	80.4

TABLE II.—RAW MATERIALS
(*Tons*)

	*Pyrites**	*Spent Oxide*	*Sulphur and H_2S*	*Zinc Concentrates*
Stock, July 1, 1946	83,412	139,128	45,776	64,447
Receipts	61,764	51,992	60,229	30,357
Adjustments ...	−75	−634	−45	+664
Use	73,366	46,845	49,054	38,285
Despatches ...	571 28†	4,656 226†	—	8
Stock, Sept. 30, 1946	71,136	138,759	56,906	57,175

* "Receipts" and "Use" include anhydrite "converted" to pyrites.
† Used at works for purposes other than sulphuric acid manufacture.
Note.—The above figures exclude Government plants except in those cases where Government plants are producing acid for trade purposes.

TABLE III.—CONSUMPTION OF SULPHURIC ACID AND OLEUM
(*July 1 to September 30, 1946*)

Trade Uses		*Tons 100% H_2SO_4*
60	Accumulators	2,097
61	Agricultural purposes	4,887
63	Bichromate and chromic acid ...	2,098
64*	Borax and boracic acid (*see* 105)	
65	Bromine	3,072
66*	Chlorsulphonic acid (*see* 105)	
67	Clays (Fuller's earth, etc.) ...	1,740
68	Copper pickling	582
69	Dealers	3,317
70	Drugs and fine chemicals ...	2,547
71	Dyestuffs and intermediates ...	14,667
72	Explosives	2,423
73	Export	664
74*	Formic acid (*see* 105)	
75	Glue, gelatine and size	96
76	Hydrochloric acid	13,731
77	Hydrofluoric acid	670
78	Iron pickling (including tin plate)	17,996
79	Leather	1,140
81	Metal extraction	190
82	Oil (mineral) refining	8,372
83	Oil (vegetable) refining	1,448
84	Oxalic, tartaric and citric acids ...	1,905
85 & 80	Paint and lithopone	16,090
86	Paper, etc.	766
87		
88	Phosphates (industrial)	1,119
89	Plastics, not otherwise classified...	4,675
90	Rare earths	2,053
91	Rayon and transparent paper ...	24,835
92	Sewage	2,078
93	Soap and glycerine	536
94	Sugar refining	118
95*	Sulphate of alumina (*see* 105)	
96	Sulphate of ammonia	53,579
97	Sulphate of barium	956
98	Sulphate of copper	5,293
99	Sulphate of magnesium	2,333
100	Sulphate of Zinc	512
101	Superphosphates	104,309
102 & 62	Tar and benzole	3,350
103	Textile uses	4,539
105	Unclassified—*Uses known ...	18,415
	Uses unknown ...	8,803
	TOTAL	338,001

I.C.I. Expansion

Grangemouth Scheme Hindered

DEVELOPMENT of the Grangemouth scheme of I.C.I., Ltd., at a cost of £3,000,000, is understood to be hindered by the question of an adequate water supply.

It is stated that the town has already given guarantees that it will supply I.C.I. with the required volume of water, but has so far been prevented from developing its water resources pending a decision by the Department of Health for Scotland, which has a long-term regional water scheme for central Scotland. The long-term scheme would probably require from 15 to 20 years to develop, whereas the immediate requirement is for a local expansion in from 12 to 18 months.

Authority has been sought to allow an increase in the local area of supply at an early date, failing which it is feared that the I.C.I. expansion scheme might be transferred to Huddersfield.

It may not be generally known that Charles Carr, Ltd., and the Non-Ferreous Casting Co. (Birmingham), Ltd., are under one direction. Their activities are described in two new booklets, *The House of Carr for Castings* and *Chill Cast Phosphor Bronze Rods and Tubes*, which may be obtained from Woodlands, Smethwick.

The Chemical Society

Faraday Lecture

AS briefly announced in THE CHEMICAL AGE last week, Sir Robert Robinson, D.Sc., LL.D., Pres.R.S., has accepted the invitation of the Council of the Chemical Society to deliver the Faraday lecture during the Society's centenary celebrations next July.

The Faraday Lectureship was founded in 1867 to commemorate Michael Faraday, who was elected a Fellow of the Society in 1842 and was one of its vice-presidents. Normally, the lecture is delivered every three years; and the lectureship is the highest honour which the Chemical Society can offer. The list of names of previous Faraday lecturers is an imposing array of the great men of chemical science: Dumas, Cannizzaro, von Hofmann, Wurtz, Helmholtz, Mendeleeff, Lord Rayleigh, Ostwald, Fischer, Richards, Arrhenius, Millikan, Willstätter, Bohr, Debye, and Lord Rutherford.

The lecture, which will be delivered in the Central Hall, Westminster, on July 16, 1947, will form the principal scientific event of the centenary celebrations. It is especially fitting that Sir Robert Robinson, a past-president of the Society, should be chosen to deliver the lecture, for, had the centenary celebrations taken place in 1941, the actual hundredth anniversary of the foundation of the Chemical Society, he would have presided over them. Moreover, Sir Robert's work on electronic influences in organic chemistry not only has a link with Faraday's discoveries, but forms an outstanding British contribution which the Chemical Society may be justly proud to place before the distinguished foreign guests and others attending the centenary celebrations.

The Liversidge Lecture

The eleventh Liversidge Lecture of the Chemical Society will be delivered by Professor Harold C. Urey at the Royal Institution, Albemarle Street, London, W.1, on December 18, at 7.30 p.m.

Professor Urey, who is coming from the United States at the society's special invitation, is best known as the discoverer of heavy hydrogen. A 1934 Nobel Prizeman, he has been identified for many years with the isolation of isotopes and has taken a notable part in this connection in the development of the atomic bomb. In 1940 he was awarded the Davy Medal of the Royal Society. He is Professor at the Institute of Nuclear Studies in the University of Chicago.

The title of Professor Urey's lecture is "Some Problems in the Separation of Isotopes" and it is in keeping with the tradition of the Liversidge Lectureship which deals with new knowledge in general, physical, and inorganic chemistry.

The first lecture of the series was delivered in 1928 by Professor F. G. Donnan; and the list of lecturers includes Herbert Freundlich, C. N. Hinshelwood, N. V. Sidgwick, and F. W. Aston.

Sir Robert Robinson.

Andersonian Chemical Society

Diamond Jubilee Celebration

ONE of the oldest among students' chemical societies, the Andersonian Chemical Society at Glasgow Royal Technical College, has a record of sixty years' continuous operation. It was founded in 1886, so this year marks its diamond jubilee.

So notable an occasion deserved recognition, and a modest but interesting programme has been arranged to take place at the Society's premises next Friday, November 22. Dr. D. S. Anderson, B.Sc., A.R.T.C., M.I.Mech.E., Director of the Royal Technical College, will open the proceedings at 2.30 p.m. An address will follow by Professor J. W. Cook, D.Sc., Ph.D., F.R.I.C., F.R.S., Regius Professor of Chemistry, Glasgow University. Thereafter, until 5.30 p.m., the chemical laboratories will be open for inspection.

The Andersonian Chemical Society took its name from the Andersonian University, founded in 1796 under the will of John Anderson, M.A., F.R.S. (1726-1796), Professor of Natural Philosophy in Glasgow University. This institution, later to become the Glasgow and West of Scotland Technical College, and now the Royal Technical College, provided opportunities for "liberal and scientific education of all classes."

Parliamentary Topics

Fuel Economy Conference

IN the House of Commons last week, Mr Janner asked the Minister of Fuel whether he would consider issuing a White Paper setting out the principal lessons learned at the recent Fuel Economy Conference organised by his Department, together with an indication of what action was to be taken to implement such of the lessons as had been approved by him.

Mr. Shinwell replied that he had already arranged for the proceedings of the conference to be published. All the papers and recommendations were being exhaustively studied by the Fuel Efficiency Committee, as well as by his department, and would be published or publicised in due course in the manner best designed to secure practical results. The action to be taken on the recommendations would necessarily be continuing action, much of it over a long period

Fuel Oil Subsidy

Mr. Shinwell, in reply to Sir Patrick Hannon, stated that details of the fuel oil subsidy scheme were published in the daily and technical press on or about October 1, the date from which the subsidy became payable. At the same time, it was announced that the normal peacetime system of zonal pricing of black oils, and of the granting of quantity rebates to all consumers buying more than 100 tons of oil a year was being reintroduced.

Sir P. Hannon: Does that mean that the functions of the Petroleum Board are now in the hands of the right hon. gentleman?

Mr. Shinwell: I would not go so far as that, but there is very close liaison between the two parties.

Linseed Oil

The Minister of Food, asked by Mr. Bossom whether he had given instructions that special efforts should be made by the British representatives in the Argentine to endeavour to make available more linseed oil, replied in the affirmative and added that 27,000 tons of linseed oil were now being shipped to this country. Answering a further question by Mr. Nutting, Mr. Strachey said the first shipment reached London last week. A second ship was now loading; and sufficient freight space had been booked to cover the remainder of the purchase.

Industrial Diseases

The Lord President of the Council, asked by Mr. Janner whether he would give some indication of the research work now permitted on various industrial diseases by the Medical Research Council, said the Medical Research Council maintained three departments for that purpose as part of their own staff organisation, and also supported research work elsewhere by means of temporary grants. The subjects under investigation were of the following general kinds: disorders caused by inhalation of dusts, by exposure to chemical substances, or by other special conditions of work; increased liability in certain occupations to diseases not specifically industrial; and occupational conditions which, without causing definite disease, affected the health, comfort and efficiency of workers.

Tanganyika Ground Nuts

Mr. Dodds-Parker asked the Minister of Food what is the earliest date at which it is estimated that a crop will be forthcoming under the ground nut scheme for Tanganyika; to what extent the scheme is dependent on the provision of agricultural machinery on a large scale; and whether, in view of the need for increasing world supplies of fats, he will give an assurance that the highest priority will be given to providing machinery.

Mr. Strachey replied that the earliest date at which a crop could be harvested would be April and May, 1948, and he hoped that the first supplies may be forthcoming by then. The scheme was, however, entirely dependent upon the availability of machinery for clearing the bush, agricultural machinery and other special mechanical equipment. Every effort would be made to obtain the equipment.

Plastic Material

Mr. J. Morrison asked the President of the Board of Trade why it was not possible to purchase plastic mackintoshes without coupons, while the same plastic material could be purchased by the yard without coupons.

Mr. Belcher said the conversion of plastic material to clothing involved the use of making up facilities, and coupons were reasonably charged. He should not wish to add plastic material to the ration in view of its various household uses.

A useful "Valve and Service Guide" has been issued by the Mullard Wireless Service Co., Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

Philips Industrial (Philips Lamps, Ltd.) have produced a new type in their range of magnetic filters in which the method of cleaning the filter has been radically altered to meet the special requirements of certain operations, such as grinding, where ferrous contamination is very heavy and quick and easy cleaning is of first importance.

Personal Notes

SIR EDWARD HOARE, Bt., has joined the board of directors of New Metals & Chemicals, Ltd.

MR S. W. WEST, of the X-ray Division, Philips Lamps, Ltd., is to join the North American Philips Company as technical manager, X-ray Division, in the New York Office.

DR. H. W. KEENAN, president of the Oil and Colour Chemists' Association, has succeeded the late Mr. Douglas Wait as examiner in the paint, colour and varnish examinations of the City and Guilds of London Institute.

MR. NORMAN SHELDON, A.R.C.S., F.R.I.C., vice-president of the British Association of Chemists, has been elected as a Conservative member of Twickenham Borough Council. He secured a large majority over his Labour and Liberal opponents.

MR. A. G. JEACOCK, who has retired from the position of chief analyst at the Pilkington-Sullivan Works of I.C.I. (General Chemicals Division), has been engaged in the chemical trade for nearly 48 years, the last 35 years being spent in Widnes. He is a former chairman of Runcorn Urban District Council, and a former captain of Runcorn Golf Club.

DR. T. W. J. TAYLOR has been appointed principal of the new University College of the West Indies. For many years after getting a "first" in chemistry at Oxford he was tutor to Brasenose chemists and demonstrated in organic chemistry at the Dyson-Perrins Laboratory. After a short period of war service in the Middle East, he went to Washington in January, 1943, as secretary (and later director) of the British Commonwealth Scientific Office. He became scientific adviser to the Supreme Allied Commander, S.E. Area, in March, 1944, and returned to Oxford in October, 1945. He was awarded the C.B.E. for his war services.

Obituary

MR. J. E. HEWLETT, whose death has occurred at the age of 61, was deputy chairman of the Anchor Chemical Co., Ltd., Clayton, and a director of the United Oil and National Gas Products Corporation, Ltd. An alderman of the city of Manchester, he was also a J.P. and a prominent Freemason.

We regret to announce the death at Teddington, on November 4, after a long illness, of MRS. ISABELLA KELL SHELDON, wife of Mr. Norman Sheldon, vice-president of the British Association of Chemists, and take this opportunity of extending our sincere sympathy to Mr. Sheldon.

A Chemical Centenary

Manchester Company's Progress

PETER SPENCE & SONS, LTD., of Manchester and Widnes, celebrates its centenary this month. The company began the manufacture of alum by a new and revolutionary process invented by the founder of the firm, the late Peter Spence, in 1846. Until then, the manufacture of alum had not changed materially since the days of Queen Elizabeth.

From this basis the company has developed its processes and today manufactures, largely from indigenous materials, a range of products which find their outlets in utility services and industrial undertakings throughout the world. The paper trade in particular has for many years been served by the company, which has established a wide connection in that branch of industry. Starting, in its early days, with a small site in Manchester, the company transferred its activities during its progressive history to larger and more modern works in various parts of the country, and today manufactures its products at Widnes, Goole, Bristol and Bushey.

The company's policy has always been to keep to the forefront of current thought, not only in the technical sense, but also in employee relationships and amenities. It is interesting to note the unique continuity of family association in that throughout its existence the company has been directed and guided by a member of the Spence family. Notable progress has been made during recent years and the company's war record is one of which everyone is justly proud.

German Technical Reports

Latest Publications

A FURTHER selection of recent technical reports from Intelligence Committees in Germany is given below. Copies may be obtained from H.M. Stationery Office at the prices quoted.

BIOS 458. (Appendix). Report on the ceramic industry in Germany (4s.).

BIOS 538. Report on German patent records (1s. 6d.).

BIOS 610. German tinplate industry (2s. 6d.).

BIOS 649. Piel and Adey gravity die-casting process for non-ferrous metals (1s.).

BIOS 685. German ingot moulds for the casting of steel ingots (11s.).

BIOS 704. Mechanical foam liquid and equipment: Fire extinguishing (1s. 6d.).

BIOS 751. *I.G. Hoechst*: Pilot plant manufacture of vinylacetylene (6d.).

BIOS 789. *Krupp A.G., Essen, and Deutsche Edelstahlwerke A.G., Krefeld*: Special steels: Notes on practice (5s.).

General News——From Week to Week

The telephone number of the Chemical Council has been changed to REGent 1675-6.

The Ramsay Chemical Dinner, which is being held at the Marlborough House, Glasgow, on December 6, will be supported by local sections of numerous chemical and allied organisations.

Small industrial firms have received loans of £5,000,000 from the Government-sponsored Industrial and Commercial Finance Corporation, Ltd., stated Lord Piercy, chairman of the corporation, last week.

The latest publication of the National Home Safety Committee, "Hints on the Safe Use of Electricity," sets out the "Do's" and "Don't's" which every electricity consumer should know.

The opinion that the U.S.A. is still "a good long way" behind Britain in the organisation of scientific endeavour was recently expressed by Dr. Alexander King, Director of the British Commonwealth Scientific Office in Washington.

Containing 200,000 units of penicillin, ten phials were stolen from the premises of a chemist at Kirkintilloch, Scotland, but most of them were subsequently recovered by the police, who found them in the possession of schoolboys.

The Industrial Division of the Royal Society for the Prevention of Accidents is now installed in its new offices at 131, Sloane Street, London, S.W.1, but correspondence should still be addressed to Terminal House, 52, Grosvenor Gardens, London, S.W.1, which remains the Society's headquarters.

The Cement Makers' Federation has announced that owing to increasing demands it is able to make a reduction of 2s. per ton in the price of Portland and rapid hardening cement in Great Britain and Northern Ireland. The reduction is retrospective from November 1.

Manufacturing firms which are new to exporting and which have packing or packaging problems are invited to attend a one-day conference which is to be held on November 29 at 23, Knightsbridge, London, S.W.3. Details are obtainable from the Council of Industrial Design, Tilbury House, Petty France, London, S.W.1.

The slow upward movement in wholesale prices since last February, amounting in all to just over 3 per cent, as measured by the Board of Trade index number, was continued in October, average prices rising by a further 0.1 per cent, compared with September. In the "Chemicals and Oils" group, embracing 15 items, the index number of 105.1 showed a decrease of 0.8 per cent compared with September.

Among the stands at the British Export Exhibition, opened at the London Exhibition Centre, New Coventry Street, W.1, this week, is one featuring "Fertosan" compost accelerator. The exhibition, which has been organised by Leon Goodman Displays, Ltd., is open daily (excepting Sundays) until November 23 from 9.30-6 (Saturdays 9.30-1).

D.T.D. Specification No. 678, "Methyl Bromide," is now obtainable from H.M. Stationery Office (price 6d.). Amendment List No. 1 has been issued to D.T.D. Specification No. 133C, "Aluminium Alloy Sand or Die Castings (Heat Treated)" (price 1d.) and No. 363A, "Aluminium Alloy Extended Bars and Sections (Bars and Extended Sections up to 6 in. diameter or width across flats)" has been reprinted to incorporate Amendment List No. 1 (price 1s.).

Atomic energy will not be ready to take its place in engineering practice for another ten years, in the opinion of Mr. W. D. Oliphant, B.Sc., A.M.I.E.E., F.Inst.P., F.R.S.E., of the research staff of Ferranti, Ltd., speaking recently on the subject of "Nuclear Energy" at a meeting of the Scottish Students' Section of the Institution of Electrical Engineers. He expressed the belief that atomic energy would be most applicable in large power installations, but could not at present visualise its being practicable in small devices.

The Institute of Fuel's headquarters will shortly be transferred from their war-time address at 30, Bramham Gardens, London, S.W.5, to their own premises at 18, Devonshire Street, W.1, where, for the first time in the Institute's history, a members' room and library will be available, as well as a council chamber and committee room, for which there was no accommodation at the war-time offices. A Building Fund Appeal Committee has been appointed to raise £25,000 for the purchase and equipment of the new premises, which have been secured on a long lease.

Following the reduction in price of the Government-owned stock of mercury metal (from £30 to £25 per bottle of 76 lb.), the Board of Trade have decided that the import of mercury shall revert to private trade as from November 7, 1946. Supplies of mercury may still be obtained from the Government store until such time as users are able to make their own buying arrangements. It is hoped such arrangements will be made before December 31, 1946. Users intending to make direct imports should submit an import licence application to the Import Licensing Department, Board of Trade, 189, Regent Street, London, W.1.

Thirty thousand operative dyers, bleachers and finishers will receive advances in wages as the result of an agreement between the Allied Association of Bleachers, Dyers, Printers and Finishers and the National Union of Dyers, Bleachers and Textile Workers. The working week will be 45 hours, instead of 48. Male adult time workers will receive an increase of 3s. on a 45-hour week, and adult females 2s. 8d., with proportionate increases for juveniles.

Foreign News

The world's first continuous seamless pipe mill, it is reported, is to be erected in Ohio, U.S.A., by the National Tube Co.

A million-dollar plant for chemical specialities is to be built at West Toledo, Ohio, by the Du Pont Company.

Atomic power plant can be constructed to run at a cost only 26 per cent above that of one using coal, according to a report by American scientists.

A 4 to 5 year shortage of trained technical men, as a result of war-time demands on manpower, is shown in a survey of industry in the United States.

For the production of penicillin, construction of a plant at Stockholm, Sweden, is planned by Technical Enterprises, Inc., of New York.

Switzerland has removed restrictions on the purchase and holding of gold coins, under a decree published by the Federal Finance Excise Department.

With a total capacity of 20 tons daily, Bombay Province will have three caustic soda and chlorine plants under the Indian Government's decentralisation scheme.

The first international congress to be held by the South American Petroleum Institute, formed a few years ago, is to take place in Lima, in March.

An annual output of 250,000 tons of nitrate and fertiliser is planned by Fertiliser and Chemical Industries of Egypt, a company newly formed in Cairo with a capital of £4,000,000.

India's exports to Australia of drugs, chemicals and fertilisers have increased sevenfold in recent years, the total value in the twelve months 1944-5 being £42,358, whereas the figure for 1938-9 was only £6199.

With the object of evolving national standards in respect of structures, commodities, materials and operations and for promoting standardisation, quality control and simplification in industry and commerce, the Indian Government has announced the setting up of what is to be known as the Indian Standards Institution, with headquarters in New Delhi.

Protein concentrate which contains all the essential amino acids is claimed to have been developed by Frederick Stearns and Co. in the United States.

One of three American centres where research in nuclear physics is to be carried out, Camp Upton on Long Island has been selected for the projected new Northeast National Laboratory.

An institution of technology, complementary to the University, is to be established by New South Wales Government, the intention being that it shall be of national rather than State significance.

The Canadian Minister of Trade and Commerce, Mr. J. A. Mackinnon, has announced a plan to hold Canada's first International Trade Fair at Toronto Coliseum in the first two weeks of June, 1948.

Discovery of two new drugs for treatment of sleepy sickness is reported from New York. A new drug which acts against half-a-dozen types of infections is claimed to have been discovered by research workers of the American Parke, Davis & Co.

France's glue-producing capacity was unaffected by the war, it is reported; and expectation is that 70 per cent of its pre-war annual output of 5900 tons will be reached in 1946 and that by 1947 the pre-war level will have been recovered.

The Malayan Union Government has announced a reduction as from November 11 in the export duty on rubber to 2¾ cents per pound from 4 cents per pound. In Penang, which is the Union's free port, the excise duty on rubber has been reduced similarly to 2¾ cents.

The Italian Government has recently granted a concession for the exploration of petroleum deposits in Sicily to an American company, the McMillam Petroleum Corporation of New York. Drilling operations are to extend over a territory of about 13,000 hectares and it reported that work is to start at an early date.

In Italy a new company is to be formed, with an initial capital of 100,000,000 lire, to engage in the import and manufacture of special American pharmaceutical products. At the same time, the new enterprise will make available, to Italian pharmaceutical companies, details of scientific and technical progress in recent years in the American pharmaceutical industry.

Increased production, lowered costs and competitive conditions have brought the price of penicillin down in the U.S.A. to the record low level of 50 cents per vial of 100,000 units to hospitals and about 40 cents per vial to wholesalers. This compares with the price of 75 dollars per vial in January, 1944, shortly after penicillin was first made available for general use.

The Standard Oil Company of California is planning the construction of an oil refinery near Alexandria for the treatment of Arabian crude oil, according to a statement by the group's president, Mr. R. G. Follis, in which he also revealed that oil production in Saudi Arabia now totals roundly 9,000,000 tons a year and could easily be increased.

Turkey's five-year industrial plan includes construction of three chemical undertakings: At Kütahya, a nitrogen factory to produce 6000 tons of nitric acid and 30,000 tons of various nitrates annually; at Istanbul or near Izmit, a soda factory to produce 20,000 tons of carbonate of soda and 6000 tons of caustic soda annually; at Izmit a factory for sulphate of copper; and at Gemlik one for carbon disulphide.

Negotiations have been successfully completed, between the Government of Travancore State and representatives of mineral companies operating at Trivandrum, for the erection of a factory in Travancore. A representative of the Du Pont de Nemours group has also participated in the negotiations. Arrangements have also been made for the mining, processing and exporting of titanium containing sand.

Two fusions of Malayan rubber companies are stated to be under consideration. The Straits Rubber Company, having an issued capital of £787,500, is to merge with Batak Rabit Rubber Estate, issued capital £75,000. The second fusion involves the Bagan Serai, Glenshiel, and Merchiston companies, having combined issued capital of £288,000. Treasury permission has been obtained for the first scheme, but the second is still subject to sanction.

Forthcoming Events

November 18. Society of Chemical Industry (Plastics Group). Royal Institution, 21, Albemarle Street, London, W.1, London, 6.30 p.m. Mr. F. P. Dunn: "British Chemical Publications."

November 18. Society of Chemical Industry (London Section, jointly with Food Group). Royal Institution, Albemarle Street, London, W.1, 6.30 p.m. Mr. F. P. Dunn: "British Chemical Publications" (Jubilee Memorial Lecture).

November 19. Hull Chemical and Engineering Society. Church Institute, Albion Street, Hull, 7.30 p.m. Dr. L. Mullins: "X-rays in Industry."

November 19. Institution of Rubber Industry. Waldorf Hotel, London, W.C.2, 6.30 p.m. Mr. M. M. Heywood: "The Clean Handling of Black."

November 20. Society of Dyers and Colourists (Midlands Section). Midland Hotel, Derby, 7 p.m. Mr. C. C. Wilcock: "Preparing, Dyeing and Finishing of the New Fibres."

November 20. The Chemical Society (jointly with Dublin Section of R.I.C.). University College, Upper Merrion Street, Dublin, 7.30 p.m. Dr. T. G. Brady: "Biochemical Microtechnique."

November 20. Institution of the Rubber Industry (Leicester Section). College of Art and Technology, Leicester, 7.30 p.m. Mr. F. S. Roberts: "Rubber Compounding Ingredients."

November 21. The Chemical Society. Chemistry Lecture Theatre, The University, Sheffield, 6 p.m. Dr. C. H. Desch: "Chemistry in the Metallurgical Industries."

November 21. The Chemical Society, Society of Chemical Industry, Royal Institute of Chemistry. (Edinburgh and East of Scotland Sections). North British Station Hotel, Edinburgh, 7.30 p.m. Professor F. S. Spring, D.Sc.: "Some Developments in the General Methods of Organic Chemistry."

November 21. The Chemical Society. Burlington House, Piccadilly, London, W.1, 7.30 p.m. Mr. H. D. C. Waters, Mr. A. R. Caverhill and Mr. P. W. Robertson: "The kinetics of halogen addition to unsaturated compounds—XII" and "Iodine catalysts of chlorine and bromide addition to ethyl cinnamate."

November 21. The Chemical Society. Burlington House, Piccadilly, London, W.1, 7.30 p.m. Mr. A. Robertson and Mr. W. A. Waters: "Evidence for the Homolytic Bond Fission of 'Positive Halogen' Compounds."

November 22. Society of Chemical Industry. (Chemical Engineering Group). Geological Society's Rooms, Burlington House, Piccadilly, London, W.1, 5.30 p.m. Mr. H. B. Fergusson: "Welding of High-Pressure Vessels for the Chemical and Oil Refinery Industries."

November 22. Institute of Physics (Industrial Spectroscopic Group). Department of Applied Science, The University, Sheffield, 2.15 p.m. Mr. D. M. Smith: "The Spectographic Analysis of High-purity Materials."

Company News

The nominal capital of **Allied Paints and Chemicals, Ltd.,** Wharfedale Road, Tyseley, Birmingham, has been increased beyond the registered capital of £10,000 by £40,000, in £1 ordinary shares.

The nominal capital of **Southon Laboratories, Ltd.,** 88, Upper Richmond Road, Putney, S.W.15, has been increased beyond the registered capital of £100 by £24,900 in £1 ordinary shares.

New Companies Registered

Ingram and Parish, Ltd. (423,115).—Private company. Capital £5000 in £1 shares. Manufacturers of and dealers in chemicals, etc. Directors: Wm. F. Ingram; Albert C. Parish. Registered office 28, Museum Street, London, W.C.1.

Anglo Scottish (General Exports) Ltd. (24,687).—Private company. Capital £1000 in £1 shares. Merchants, exporters and importers of chemicals and chemical products, etc. Directors: W. G. Kerr: G. D. W. Organ. Registered office: 20, Renfield Street, Glasgow, C.2.

Charles Leatherbarrow, Ltd. (423,009).—Private company. Capital £10,000 in £1 shares. Manufacturers and processors of plastics, coal, coal products, chemicals, etc. Directors: Wm. C. Leatherbarrow; John E. I. Lyde. Registered office: 6, Stanley Street, Liverpool, 1.

Mono-Plastic Chemicals, Ltd. (423,134.—Private company. Capital £50,000 in ordinary shares of 1s. and 7 per cent participating cumulative preference shares of £1. Manufacturers of and dealers in chemicals, etc. Directors: Victor N. Scott; Albert A. Henly. Registered office: 19, Grosvenor Place, London, S.W.1.

Bioplastics, Ltd. (422,775).—Private company. Capital £50,000 in 1s. shares. Investigation, acquisition and development of inventions, processes, brevets d'invention, concessions and the like relating to scientific, chemical, metallurgical research, etc. Directors: Sir C. Courtney; R. Evans; J. Lecher. Registered office: 1, Cumberland House, Kensington Court, London, W.8.

Chemical and Allied Stocks and Shares

HOME and international political uncertainties have checked the recent strong upward movement in stock markets, business in most sections showing some contraction, while industrial shares reflected moderate profit-taking. British Funds eased, but later rallied. There were further gains among colliery shares, and iron and steels have been firm with moderate gains predominating; but home rails lost ground among other nationalisation groups, partly owing to the L.M.S. statement regarding shortages of materials and labour.

Chemical and kindred shares continued to reflect encouraging export trade news and indications of the progressive policy being followed by the industry. Imperial Chemical were good at 43s. 6d., B. Laporte 98s. 1½d., Fisons 58s. 3d., W. J. Bush 92s. 6d., and Greeff-Chemicals Holdings 5s. ordinary 12s. 7½d. British Drug Houses at 56s. 9d., lost part of their recent rise, but Stevenson & Howell showed firmness at 30s. 6d. following the interim dividend, and Morgan Crucible were good at 54s. 6d. with the 5½ per cent preference 30s. 9d., and the 5 per cent preference 29s. 9d. Paint shares lost ground owing to further news of the effect on output of raw material shortages, but share prices showed some recovery later, Lewis Berger being £6¾ on hopes of an increase in the forthcoming dividend. Goodlass Wall 10s. ordinary were 30s. 9d., and Wailes Dove 5s. ordinary 21s. 6d. United Molasses at 52s. 10½d., Turner & Newall at 85s. 9d. and Lever and Unilever 48s.xd. lost part of recent gains. Announcement of lower cement prices affected cement shares, Associated Cement losing ground at 66s. 6d. British Plaster Board were 32s. 9d. and in other directions, Dunlop Rubber eased to 51s. 6d. Despite hopes of an increase in the forthcoming interim dividend, the units of the Distillers at 134s. 6d. lost part of their recent rise. Tube Investments moved back to £6 3/16 on the dividend, the market apparently having been hopeful that last year's special payment would have been repeated; although it was recognised that it has been officially stated that the steel scarcity is affecting some of the group's activities.

Guest Keen were firm at 42s. 9d.xd. United Steel strengthened to 24s. 9d. on the results, T. W. Ward were good at 44s. 9d., and among collieries, Shipley moved up to 43s., Sheepbridge to 47s. 9d., and Powell Duffryn were 26s. Babcock & Wilcox at 65s. 9d., regained part of an earlier decline, as did Allied Ironfounders at 58s. 6d. Amalgamated Metal moved up to 20s. 6d. on hopes that the London metal market may be reopened shortly. British Aluminium have been active at 44s. 9d. on further news of the increasing uses of the metal and on the company's interest in the newly-formed Aluminium Wire and Cable Co. in which Hawker Siddeley Aircraft and Tube Investments are also interested.

Electrical equipments lost a small part of earlier gains, although this section was helped by the large volume of business likely to accrue in future from railway electrification schemes. General Electric were 101s. 6d. Associated Electrical 70s. Johnson & Phillips 79s., and English Electric 62s. 3d. Metal Box shares showed steadiness at £5½ and Murex rallied to 90s., but in other directions, De La Rue have receded slightly to £13⅛ and British Industrial Plastics were 7s. 3d. British Glues & Chemicals 4s. ordinary moved up further to 17s. Beecham deferred eased to 26s. 6d., Boots Drug were 60s. 6d., Sangers 34s., and Timothy Whites 46s. Oils have been uncertain, with Anglo-Iranian 95s. Shell 90s. and Burmah 65s. 7½d., although Trinidad Central rose 1s. to 23s. 6d.

Prices of British Chemical Products

REPORTS from almost all sections of the London industrial chemical market indicate a sustained demand with little, if any, improvement in the supply position. Contract deliveries are well up to schedule, but replacement business is somewhat influenced by the general firmness displayed throughout the market. There has been no abatement in the flow of export inquiries, though there is little prospect of fulfilling, in the immediate future, more than a part of the overseas requirements. The routine trade in the soda products section appears to be maintained, while a ready market awaits offers of the potash compounds. Formaldehyde, arsenic, sal-ammoniac, and hydrogen peroxide are in good call at unchanged rates, while acetic acid, oxalic acid and tartaric acid supplies are insufficient to meet the full current needs. There is little change to report in the coal-tar products market, where values continue very firm. Creosote oil and pitch are items for which there is an active demand.

MANCHESTER.—A steady outlet has been reported on the Manchester chemical market during the past week for textile bleaching, dyeing, and finishing materials, and both delivery specifications and new business in these have been on a satisfactory scale. Other leading industrial consumers on the home market are also calling for good supplies. Shippers have been anxious inquirers for a fairly wide range of chemicals, both light and heavy, and additional new business for export has been placed. At the moment, buying in the fertiliser market is largely concerned with slag and lime, with a moderate new business passing in superphosphates and the compound manures. Most of the tar products are moving steadily into consumption against existing orders.

GLASGOW.—The limited supplies forthcoming of general chemicals have made it difficult to meet even the moderate home demand during the week. Prices have been maintained firm, though there have been small increases in certain cases.

Price Change

Rise: Copper sulphate.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £47 10s.; 80% pure, 1 ton, £49 10s.; commercial glacial, 1 ton, £59; delivered buyers' premises in returnable barrels: £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 50 tons and over, £65; 10/50 tons, £65 10s.; 5/10 tons, £66; 1/5 tons, £66 10s.; single drums, £67 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £16 per ton, f.o.r. MANCHESTER: £16 to £16 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—MANCHESTER: £40 per ton d/d.

Ammonium Carbonate.—£42 per ton d/d in 5 cwt. casks. MANCHESTER: Powder, £43 d/d.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £19 10s. per ton. See also Salammoniac.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Antimony Oxide.—£120 to £123 per ton.

Arsenic.—Per ton, 99/100%, £38 6s. 3d. to £41 6s. 3d., according to quality, ex-store.

Barium Carbonate.—Precip., 4-ton lots, £19 per ton d/d; 2-ton lots, £19 5s. per ton. bag packing, ex works.

Barium Chloride.—98/100% prime white crystals, 4-ton lots, £19 10s. per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £18 15s. per ton d/d; 2-ton lots, £19 10s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s. B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton, ex store.

Charcoal, Lump.—£22 per ton, ex wharf. Granulated, £27 per ton.

Chlorine, Liquid.—£23 per ton, d/d in 16/17 cwt. drums (3-drum lots).

Chrometan.—Crystals, 5⅝d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Copper Carbonate.—MANCHESTER: £8 15s. per cwt. d/d.

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Sulphate.—£34 5s. per ton, f.o.b., less 2%, in 2 cwt. bags.

Cream of Tartar.—100 per cent., per cwt., from £12 14s. 6d. for 10-cwt. lots to £14 1s. per cwt. lots, d/d. Less than 1 cwt., 2s. 5½d. to 2s. 7½d. per lb. d/d.

Formaldehyde.—£27 to £28 10s. per ton in casks, according to quantity, d/d. MANCHESTER: £28.

Formic Acid.—85%, £54 per ton for ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1260 s.g., in tins, £4 16s. 6d. to £5 10s. 6d. per cwt., according to quantity; in drums, £4 2s. 6d. to £4 16s. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—11d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Lactic Acid.—Pale tech., £60 per ton; dark tech., £53 per ton ex works; barrels returnable.

Lead Acetate.—White, 70s. to 75s. per cwt., according to quantity.

Lead Nitrate.—About £70 per ton d/d in casks. MANCHESTER: £70 to £72.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £71; orange lead, £83. Ground in oil: Red, £92; orange, £104. Ready-mixed lead paint: Red, £99; orange, £111.

Lead, White.—Dry English, in 8-cwt. casks, £83 per ton. Ground in oil, English, in 5-cwt. casks, £102 per ton.

Litharge.—£68 10s. to £71 per ton, according to quantity.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £36 per ton.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., for 2-cwt lots, 9s. 1d.; smaller quantities dearer.

Mercurous Chloride.—10s. 1d. to 10s. 7d. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. per gal.; pyridinised 64° O.P. 100 gal., 3s. 1d. per gal.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£100 to £105 per ton in ton lots packed in free 5-cwt. casks. MANCHESTER: £5 to £5 2s. 6d. per cwt.

Paraffin Wax.—Nominal.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate.—Crystals and granular, 7½d. per lb.; ground, 8½d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £57 per ton for 5-ton lots, £57 10s. per ton for 1 to 5-ton lots, all ex store; hydrated, £51 per ton for 5-ton lots, £51 10s. for 1 to 5-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £8 6s. 3d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £19 10s. per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 9d. to 2s. 1d. per lb. d/d.

Soda, Caustic. — Solid 76/77%; spot, £16 7s. 6d. per ton d/d.

Sodium Acetate.—£42 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 6½d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £19 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£45 to £47 per ton.

Sodium Hyposulphite.—Pea crystals 19s. per cwt. (ton lots); commercial, 1-ton lots, £17 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., for not less than 28 lb., 10s. 2d. per lb.

Sodium Metaphosphate (Calgon).—11d. per lb. d/d.

Sodium Metasilicate.—£16 10s. per ton, d/d U.K. in ton lots.

Sodium Nitrite.—£23 per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt.

Sodium Phosphate.—Di-sodium, £25 per ton d/d for ton lots. Tri-sodium, £27 10s. per ton d/d for ton lots (crystalline).

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber Salt).—£5 5s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 11s. per ton d/d station in bulk. MANCHESTER: £4 12s. 6d. to £4 15s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot, £20 2s. 6d. per ton, d/d, in drums; crystals, 30/32%, £13 7s. 6d. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £20 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £14 5s. to £16 10s., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. 8d. to £7 2s. 8d. per ton; 140° Tw., arsenic-free, £4 11s. per ton; 140° Tw., arsenious, £4 3s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt., for 10 cwt. or more, £15 8s.; 5 to 10 cwt., £15 9s. 6d.; 2 to 5 cwt., £15 11s.; 1 to 2 cwt., £15 13s. Less than 1 cwt., 3s. 1d. to 3s. 3d. per lb. d/d, according to quantity.

Tin Oxide.—1 cwt. lots d/d £25 10s.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £54 5s.; green seal, £53 5s.; red seal, £51 15s.

Zinc Sulphate.—Tech., £25 per ton, carriage paid.

Rubber Chemicals

Antimony Sulphide.—Golden, 1s. 8½d. to 2s. 7½d. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£44 to £49 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £28 2s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Imported material, 11% nitrogen, 48% phosphoric acid, per ton in 6-ton lots, d/d farmer's nearest station, in November £20 2s., rising by 2s. 6d. per ton per month to March, 1947.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in November £9 17s., rising by 1s. 6d., per ton per month to March, 1947.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £14 18s. 6d.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £17 5s. per ton; granulated, over 98%, £16 per ton.

Coal Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 11½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 9½d. to 11½d. per lb., d/d; crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 5¾d. to 8d. per gal., according to quality, f.o.r. maker's works. MANCHESTER, 6½d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £7 2s. 6d. to £10 per ton, according to m.p.; hot-pressed, £11 10s. to £12 10s. per ton, in bulk ex works; purified crystals, £25 15s. to £28 15s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 75s. per ton f.o.r. suppliers' works; export trade, 120s. per ton f.o.b. suppliers' port. MANCHESTER: 77s. 6d. f.o.r.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. MANCHESTER: 14s. 6d. to 18s. 6d. per gal.

Toluol.—Pure, 3s. 1d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 1d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—November 13.—For the period ending Nov. 30 (December 7 for refined oils), per ton, naked, ex mill, works or refinery, and subject to additional charges according to package: LINSEED OIL, crude, £135. RAPESEED OIL, crude, £91. COTTONSEED OIL, crude, £52 2s. 6d.; washed, £55 5s.; refined edible, £57; refined deodorised, £58. COCONUT OIL, crude, £49; refined deodorised £56; refined hardened deodorised, £60. PALM KERNEL OIL, crude, £48 10s.; refined deodorised, £56; refined hardened deodorised, £60. PALM OIL (per ton c.i.f.), in returnable casks, £42 5s.; in drums on loan, £41 15s.; in bulk £40 15s. GROUNDNUT OIL, crude, £56 10s.; refined deodorised, £58; refined hardened deodorised, £62. WHALE OIL, refined hardened, 42 deg., £89; refined hardened, 46/48 deg., £90. ACID OILS: Groundnut, £40; soya, £38; coconut and palm-kernel, £43 10s. ROSIN: Wood, 32s. to 45s.; gum, 44s. to 54s. per cwt., ex store, according to grade. TURPENTINE, American, 87s. per cwt. in drums or barrels, as imported (controlled price).

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each. Numbers given under "Applications for Patents" are for reference in all correspondence up to acceptance of the complete specification.

Applications for Patents

Organosilicic resins.—Soc. des Usines Chimiques Rhône-Poulenc. 29700.

Waterproof coatings.—Soc. des Usines Chimiques Rhône-Poulenc. 29791.

Aerosols.—Soc. pour la Mise en Valeur des Brevets et Procédés d'Aórosolation du Docteur Dantrebande Euratmos. 29292-5.

Solders.—Standard Telephones & Cables, Ltd., and E. L. Bodycombe. 29541.

Gaseous discharge devices.—Standard Telephones & Cables, Ltd., and A. H. Reeves. 29542-7.

Flow meters.—Stoppani A.G. 29555-6.

Heat exchangers.—W. W. Triggs. (Air Preheater Corporation.) 29400.

Treating magnesium-bearing brines.—W. W. Triggs. (Dorr, Co.) 29684.

Vegetable drying oils.—W. A. Waldie, and H. A. Toulmin. 29536.

Hydro-extractors.—Watson, Laidlaw & Co., Ltd., and P. Russell. 29804.

Polymers.—Westinghouse Electric International Co. 29401.

Coatings.—American Viscose Corporation. 30149-50.

Hydrocarbon oils.—Anglo-Iranian Oil Co., Ltd., F. W. B. Porter, and J. W. Hyde. 30280.

Hydrocarbons.—D. Balachowsky. 30151.

Maleamic acid.—Beck, Koller & Co. (England), Ltd., R. S. Robinson, and E. L. Humburger. 30066.

Biguanide derivatives.—S. Birtwell, A. F. Crowther, F. H. S. Curd, J. A. Hendry, D. N. Richardson, F. L. Rose, and I.C.I., Ltd. 30110.

Sylvan.—J. G. M. Bremner, R. K. F. Keeys, D. J. Jones, and I.C.I., Ltd. 30357.

Furfuryl alcohol.—J. G. M. Bremner, R. K. F. Keeys, D. J. Jones, and I.C.I., Ltd. 30358.

Iron, etc., alloys.—N. E. Brookes. (Isthmian Metals, Inc.) 30537-8.

Nitronitriles.—J. L. Charlish, W. H. Davies, J. D. Rose, and I.C.I., Ltd. 30108.

Diamines.—J. L. Charlish, W. H. Davies, J. D. Rose, and I.C.I., Ltd. 30109.

Deposition of aluminium.—Chemal-Trust. 30590.

Ethers.—Ciba, Ltd. 30159-60.

Sulphuric acid.—F. A. F. Crawford, J. Bell, and I.C.I., Ltd. 30111.

Neutralisation of acid solutions.—De Directie van de Staatsmijnen. 30068.

Hydrocyanic acids.—E.I. Du Pont de Nemours & Co. 30112.

Organic compounds.—E.I. Du Pont de Nemours & Co., W. F. Gresham, and R. E. Brooks. 30261.

Silicon compositions.—H. G. Emblem, C. Shaw, and W. E. Smith. 30441.

Sulphuric acid.—A. M. Fairlie. 30052.

Vinyl halides.—B. F. Goodrich Co. 30254.

Monomeric materials.—B. F. Goodrich Co. 30255.

Coherent coatings.—B. F. Goodrich Co. 30256.

Latices.—B. F. Goodrich Co. 30384.

Thermoplastic films.—B. F. Goodrich Co. 30385.

Coating alloys.—H. E. Gresham, M. A. Wheller, and D. W. Hall. 30146.

Hydrocarbons.—Internationale A.G. für Gassynthesen. 30473.

Butadiene.—Koppers Co., Inc. 30022.

Ketones.—Koppers Co., Inc. 30024.

Sulphuric acid.—Krebs & Co., Ltd. 30216-7.

Soldering of aluminium, etc.—G. J. Kuipers. 30041.

Azo dyestuffs.—M. Mendoza, and I.C.I., Ltd. 30533.

Chemical compounds.—Merck & Co., Inc. 30461.

Synthetic resins.—Mississippi Valley Research Laboratories, Inc. 30305.

Palladium soldering.—Mond Nickel Co., Ltd. 30609.

Diallyl phthalate.—N.V. de Bataafsche Petroleum Maatschappij. 30585.

Insecticides.—Pal Chemicals, Ltd., and F. E. Smith. 30452.

Treatment of water.—Permutit Co., Ltd., R. T. Pemberton, and H. S. Lawrence. 30075-6.

Emulsifiers.—L. Powell. 30497.

Methacrylates.—Ridbo Laboratories, Inc. 30135.

Thixotropic gel systems.—Sharp & Dohme, Inc. 30059.

Treating granular material.—H. S. Simpson. 30133-4.

Organo-silicic oils.—Soc. des Usines Chimiques Rhône-Poulenc. 30329.

Aluminium soap.—Standard Oil Development Co., Ltd., and J. C. Arnold. 30579.

Piezoelectric crystals.—Standard Telephones & Cables, Ltd. 30399.

Decalcomas.—A. H. Stevens. (American Decalcomanid Co., Inc.) 30388.

Complete Specifications Open to Public Inspection

Magnesium and magnesium base alloy castings.—Aluminium Co., of America. March 7, 1945. 6973/46.

Compositions for the prevention and destruction of weeds.—American Chemical Paint Co. March 20, 1944. 26489/46.

Electrolytical oxydation process for aluminium and its alloys.—R. M. Berthier. Oct. 2, 1939. 26667/46.

Manufacture of organic compounds.—

British Celanese, Ltd. April 12, 1945. 11175/46.

Manufacture of piperidyl ketones.—Ciba, Ltd., April 10, 1945. 8785/46.

Process for the degradation of steroid compounds.—Ciba, Ltd. April 13, 1945. 10450/46.

Manufacture of semi-esters of unsaturated dicarboxylic acids.—Ciba, Ltd. April 9, 1945. 10897/46.

Polymerisation or interploymerisation of mono-olefins.—E.I. Du Pont de Nemours & Co. June 24, 1942. 10120/43.

Manufacture of polymers and interpolymers of ethylene.—E.I. Du Pont de Nemours & Co. June 26, 1942. 10422/43.

Process for the production of resinous products.—E.I. Du Pont de Nemours & Co. Aug. 6, 1942. 12691/43.

Polymerisation products of ethylene.—E.I. Du Pont de Nemours & Co. Jan. 1, 1943. 21924/43.

Acrylonitrile polymer yarn.—E.I. Du Pont de Nemours & Co. July 28, 1943. 14434/44.

Production of form-stable, rubber-like polyvinyl *n*-butyl ethers.—General Aniline & Film Corporation. April 11, 1945. 9522/46.

Process for the production of organic amides. General Aniline & Film Corporation. April 12, 1945. 11563/46.

Process for quickly drying fatty paints and other products containing siccative oils.—General Color Soc. Anon. April 13, 1945. 27140/45.

Bleaching of cellulose.—Hercules Powder Co. April 13, 1945. 31383/45.

Manufacture of carboxylic acids.—I.C.I., Ltd. April 10, 1942. 5859/43.

Manufacture of chlorinated olefines.—I.C.I., Ltd. April 10, 1942. 5860/43.

Polymerisation and inter-polymerisation of mono-olefins.—I.C.I., Ltd. June 25, 1942. 10285/43.

Manufactutre of light-polarising materials.—International Polaroid Corporation. April 11, 1945. 10010/46.

Carrying out of chemical reactions.—International Pulverising Corporation. May 2, 1942. 26759/46.

Catalytic treatment with hydrogen of glyceride oils or fats.—Lever Bros. & Unilever, Ltd. April 13, 1945. 11327/46.

Preparation of sulphanalamido heterocycles.—Merck & Co. April 10, 1945. 10209/46.

Dehydrogenation of hydrocarbons.—Shell Development Co. March 16, 1942. 5633/43.

Execution of catalytic conversions in the presence of ferrous metals.—Shell Development Co. March 28, 1942. 6532/43.

Isomerising hydrocarbons.—Shell Development Co. May 16, 1942. 8529/43.

Separation of mineral mixtures.—F. L. Smidth & Co. A/S. March 23, 1945. 26758/46.

Separating a liquid from solid material.—Soc. Anon. Française pour la Separation L'Emulsion et le Melange. (Procédés S.E.M.) April 12, 1945. 10456/46.

Refining, mixing and calibrating pulverulent material and the like operations.—Soc. Anon. Français pour la Separation L'Emulsion et le Melange. (Procédés S.E.M.) April 12, 1945. 10457/46.

Process for preparing zirconium compounds.—Soc. de Produits Chimiques des Terres Rares. March 29, 1945. 9463/46.

Preparation of therapeutically useful heterocyclic compounds.—Soc. des Usines Chimiques Rhône-Poulenc. April 13, 1945. 6897/46.

Sulphonamides.—Soc. des Usines Chimiques Rhône-Poulenc. April 11, 1945. 8236/46.

Manufacture of pyrazine.—Soc. des Usines Chimiques Rhône-Poulenc. April 11, 1945. 9196/46.

Machine for the mechanical treatment of straw and the like lignous or cellulosic material with a view to its transformation into artificial manure.—J. Stieffatre. April 9, 1945. 4228/46.

Manufacture of sulphur trioxide.—H. F. A. Topsoe. April 12, 1945. 10938/46.

Process and apparatus for producing a coating of discrete metallic particles particularly the mosaic surface of the target of an electron camera tube.—Western Electric Co., Inc. April 29, 1943. 4773/44.

Complete Specifications Accepted

Process for improving the fastness of dyeings on cellulose esters matted with titanium dioxide.—Soc. of Chemical Industry in Basle. Feb. 13, 1942. (Cognate applications 3514/43 and 3515/43.) 581,176.

Process for the catalytic cracking of hydrocarbons.—Standard Oil Development Co. Feb. 12, 1942. 581,242.

Manufacture of lubricating compositions.—Standard Oil Development Co. Dec. 30, 1941. 581,243.

Process for the synthetic manufacture of hydrocarbon oils.—M. Steinschlaeger. Sept. 3, 1942. 581,174.

Drying of soap, and the manufacture of soap powder, flakes or the like.—E. T. Webb, and Baker Perkins, Ltd. Nov. 30, 1945. 581,203.

Derivatives for polymers and interpolymers of ethylene.—D. Whittaker, J. S. A. Forsyth, and I.C.I., Ltd. Dec. 4, 1942. 581,279.

Treatment of seaweed.—J. F. Williams. Aug. 14, 1944. 581,258.

Process for the continuous recovery of unpolymerised monomers from butadiene copolymers.—Wingfoot Corporation. Aug. 26, 1943. 581,185.

Apparatus for separating liquids.—W. Alexander. May 7, 1945. 581,359.

Electrolytic protection of metal surfaces against corrosion.—J. C. Arnold, (Stan-

dard Oil Development Co.) Dec. 8, 1943. 581,341.

Centrifugal apparatus for extraction of dust and tar from gases at high temperatures.—H. Balfour & Co., Ltd., W. L. Burns, and A. C. Bureau. Sept. 5, 1944. 581,316.

Impregnation and chemical treatment of fibrous materials and tissues for plastic and protective purposes.—H. P. Bayon. March 26, 1945. 581,391.

Plasticising of fabrics and the production of laminated fabrics therefrom.—British Celanese, Ltd. Sept. 3, 1943. 581,313.

Production of artificial filaments.—British Celanese, Ltd. March 4, 1944. 581,354.

Manufacture of nitrosulphones.—G. D. Buckley, and I.C.I., Ltd. Aug. 31, 1944. 581,303.

Pyrimidine compounds.—F. H. S. Curd, F. L. Rose, and I.C.I., Ltd. Sept, 29, 1943. 581,334.

Manufacture of pyrimidine compounds.—F. H. S. Curd, F. L. Rose, and I.C.I., Ltd. Feb. 4, 1944. 581,345.

Pyrimidine compounds.—F. H. S. Curd, F. L. Rose, and I.C.I., Ltd. Sept. 29, 1943. 581,346.

Production of polyvinyl alcohol films and sheets of reduced water-sensitivity.—E.I. Du Pont de Nemours & Co. April 23, 1943. 581,387.

Production of chlorinated derivatives of ethyl alcohol.—E.I. Du Pont de Nemours & Co. March 17, 1944. 581,431.

Azo dyestuffs.—E.I. Du Pont de Nemours & Co., and J. F. Froning. Sept. 1, 1944. 581,305.

Electrowinning of manganese.—Electro Manganese Corporatiton.—Aug. 19, 1942. 581,370.

Method for the recovery of reagents in the cuprammonium process used in the manufacture of fibres and filaments.—H. G. C. Fairweather. (Rayanier, Inc.) May 22, 1932. 581,366.

Curing of polymeric materials.—D. A. Harper, W. F. Smith, and I.C.I., Ltd. Feb. 24, 1944. 581,410, 581,439.

Process for improving cellulose-, or cellulosehydrate-, textile material.—Heberlein & Co., A.G. April 10, 1943. 581,418.

Process for rendering cellulosic fibres or fabrics, transparent.—Heberlein & Co., A.G. May 4, 1944. 581,436.

Polymerisation of methacrylic acid esters. —I.C.I., Ltd. Sept. 18, 1941. 581,280.

Polymerisation of vinyl esters of organic acids.—I.C.I., Ltd. Sept. 18, 1941. 581,281.

Manufacture of polymeric materials from butadiene or its homologues.—D. B. Kelly, and I.C.I., Ltd. Jan. 5, 1944. 581,343.

Preparation of organic flurine compounds. —Kinetic Chemicals, Inc. March 17, 1942. 581,405.

Production of citric acid by fermentation. —Merck & Co., Inc. May 8, 1943. 581,389.

Methylation of amines.—Richards Chemical Works. May 8, 1943. 581,427.

Method of separating soot, flue ashes, and flue dust from the combustion gases of firing plants, and means therefor.—L. von Roll für Kommunale-Anlagen A.G. May 12, 1943. 581,426.

Manufacture of salts of aminoalkyl esters. —Soc. of Chemical Industry in Basle. Dec. 4, 1941. 581,325.

Manufacture of condensation products.—Soc. of Chemical Industry in Basle. Nov. 27, 1942. 581,339.

Bonded silicon carbide refractory compositions. A. Abbey. (Carborundum Co.) Aug. 24, 1944. 581,528.

Refining of natural or synthetic fatty oils. —Aerovox Corporation. July 7, 1942. 581,483.

Synthetic gel catalysts and the conversion of hydrocarbon oils by means of said catalysts.—C. Arnold. (Standard Oil Development Co.) Sept. 25, 1944. 581,632.

Causticisation of green liquor produced in the alkaline processes of the manufacture of paper pulp.—Associated Pulp & Paper Mills, Ltd. April 27, 1943. 581,579.

Manufacture of chloral.—W. Bridge, and I.C.I., Ltd. Sept. 28, 1944. 581,635.

Process for the production of graphite.—British Iron & Steel Corporation, Ltd., H. L. Riley, and J. Taylor. July 1, 1942. 581,569.

Process for making mono-amino-ethyl sulphuric acid ester.—Carbide & Carbon Chemicals Corporation. Dec. 31, 1943. 581,539.

Polymerisation process.—Distillers Co., Ltd., J. J. P. Staudinger, M. D. Cooke, and D. A. Bennett. Sept. 6, 1943. 581,484.

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All copper steam jacketed **PAN**, dished bottom 7 ft. overall depth by 3 ft. 6 in. dia., with strengthening ring around top ; 3-in. bottom run-off.

Open top vertical copper-lined steam jacketed **PAN**, 3 ft. dia. by 2 ft. 6 in. deep, with bolted cast iron jacket mounted on 3 supporting legs, giving height to top of pan 4 ft. ; top of pan fitted with machined cast iron rim with hinged copper cover operated by means of pulleys and balance weights ; pan fitted 2-in. bottom run-off.

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